T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

COPY

US EPA RECORDS CENTER REGION 5
483903

HYDROLOGICAL AND GROUNDWATER QUALITY INVESTIGATIONS

FOR AUTOLITE DIVISION
ALLIED CORPORATION
FOSTORIA, OHIO

February 6, 1986

Project #40601

T A GLEASON ASSOCIATES
4950 Eastern Avenue
Cincinnati, Ohio 45226
(513) 321-9950

EXECUTIVE SUMMARY

Autolite's process supply wells, B-1 and B-2, sampled total volatile organic chemicals (VOC) of approximately 20,000 ppb and 800 ppb respectively during three sampling episodes in April and May, 1984. In response to these findings, Autolite sampled six private offsite wells for analyses by Autolite's lab and two independent contract labs. Reported findings ranged from 1.5 ppb VOC in one well to below minimum detection limit (BMDL) in all wells. Autolite also contracted with T A Gleason Associates, a Cincinnati based consulting firm, to perform comprehensive hydrogeological and water quality investigation's at Autolite's Fostoria, Ohio facility.

Comprehensive hydrogeological and water quality investigations were performed at Autolite's facility in Fostoria, Ohio from September 1984 through May 1985. These investigations included the installation of test borings and soil sampling, the construction of monitor wells to depths in excess of 300 feet in the Lockport Dolomite, the performance of a full-scale pump test to measure aquifer properties, and extensive groundwater sampling and analyses.

In addition, limited off-site investigations were performed to assess the general depths, direction(s), and rates of groundwater flow. More than 85 residential and commercial wells were sampled and analyzed for volatile organic chemicals (VOC).

VOC concentrations ranging from 0 to 20,000 ppb were detected in on-site monitor wells and process water supply wells. However, analyses of the groundwater flow system indicates that the VOC plume is being contained by the pumping of the process supply wells. VOC concentrations ranging from 162 to 20,700

ppb sampled in off-site wells to the southeast and southwest of Autolite indicate that there are off-site VOC sources in addition to possible on-site sources. These off-site sources are probably contributing to the on-site plume.

No VOC were detected in residential wells sampled in the general areas south of Autolite's facilities. However, samples from 78 residential wells in the general area north and northwest of Autolite's facilities analyzed by Aqua Tech maximum VOC concentrations ranging from 1 to 40 ppb, in 33 of the wells. Of the 33 wells sampling VOC, 21 sampled less than 5 ppb, and 5 sampled more than 20 ppb. Analyses by Howard Labs found maximum VOC concentrations ranging from 1 to 52 ppb in 18 of the wells. Of the 18 wells sampling VOC, 8 sampled less than 5 ppb, and 2 sampled more than 20 ppb.

Remedial activities include the continuous pumping of an on-site process well to contain the plume and the evaluation of air stripping of the well discharge to remove VOC from the discharge stream. Further investigations are recommended to assess areas of potential on-site and off-site sources and to assess the water quality of the aquifer, particularly in the area north of Autolite.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

1.0 INTRODUCTION

1.1 BACKGROUND

During the sampling of the Autolite facility's wastewater effluent, Autolite found evidence of volatile organic chemicals (VOC) in the effluent. Because the source of the process water was two on-site wells, B-1 and B-2, both wells were sampled in April 1984 (see Figures 1-1 and 1-2)[1]. The analysis showed the presence of VOC in both wells and resampling in May 1984 confirmed levels of approximately 20 mg/l in well B-1 and approximately 0.8 mg/l in well B-2 (see Table 4-5)[2]. Six off-site wells were also sampled and analyzed in May 1984 by Autolite's laboratory, the Seneca County Health Department's (SCHD) contract laboratory, Aqua-TEch, and ETC, Autolite's contract laboratory. The results from Autolite's laboratory and ETC showed VOC concentrations of less than 10 ppb for all samples. A trace amount (1.5 ppb) of VOC was reported by Aqua-Tech in one off-site well located north of Autolite's facility. Results are presented in Table 4-9A.

1.2 PURPOSE

The purposes of our initial investigation were to assist Autolite in assessing the source(s) and extent of VOC sampled in the two on-site water supply wells and to identify and recommend necessary remedial alternatives.

During the implementation of the investigations, VOC were detected in four of six off-site residential wells sampled on November 13, 1984. These findings prompted Autolite to expand the area and scope of the investigations before the initial

[1]Figures are attached to this report at the end of the section of text in which they are first mentioned.

[2]Tables are attached to this report under the tab "Tables" following Section 4.0 of the text.

investigations were completed. The purposes of the expanded investigations were to assess the extent of VOC in the existing off-site wells and to assess the general groundwater flow system in the Fostoria area.

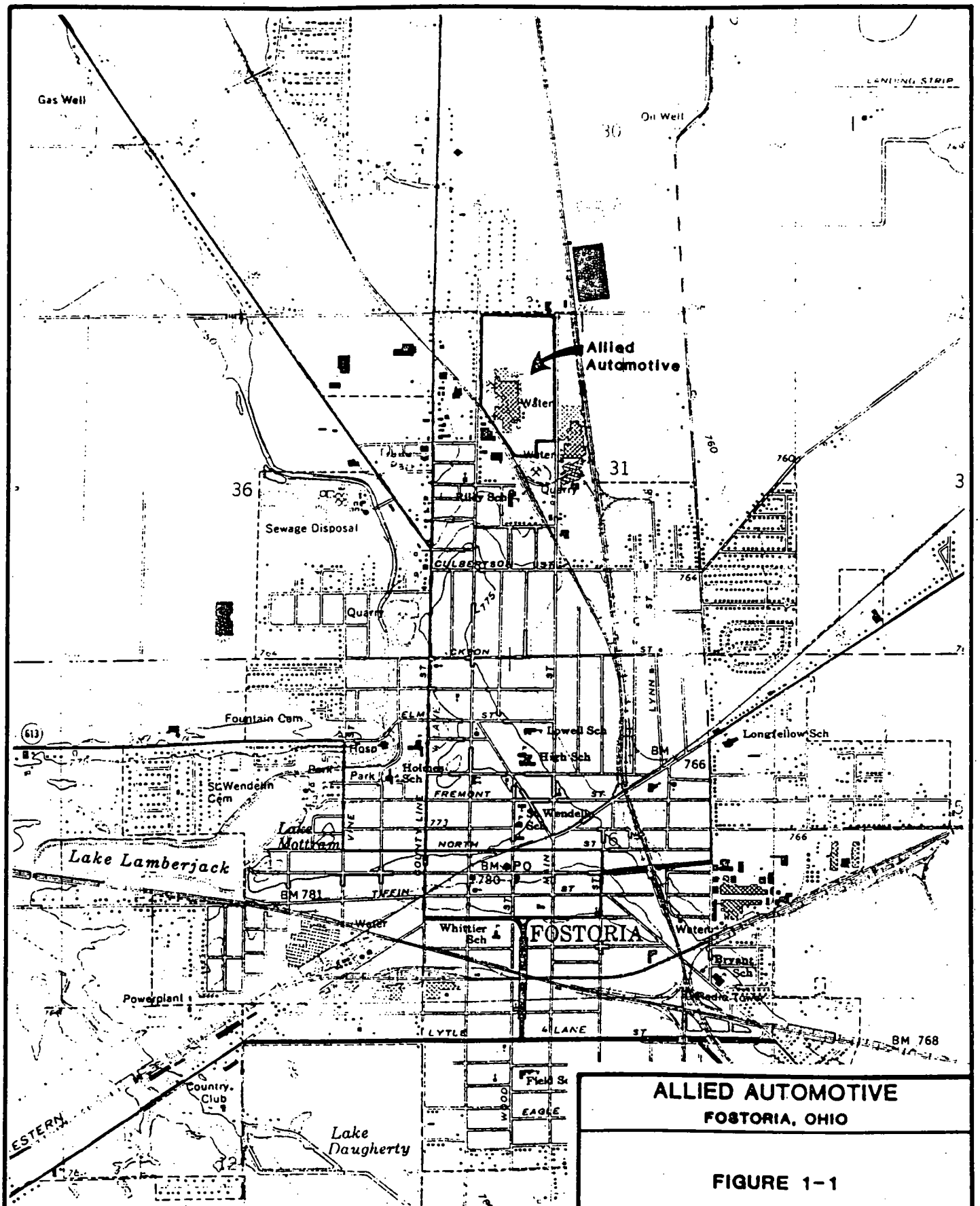
1.3 PROJECT OBJECTIVES

The initial objectives were:

1. To identify and characterize any on-site sources which may have released VOC into the groundwater
2. To delineate the extent and concentration of VOC in the groundwater on-site
3. To identify and describe method(s) to remove VOC from the aquifer and/or to mitigate the transport of VOC in the aquifer

The discovery of VOC in off-site wells during the course of the initial investigations expanded the investigation to include the following additional objectives:

4. Assess the extent of VOC in off-site potable water supply wells
5. Assess the groundwater flow system in the Fostoria area



ALLIED AUTOMOTIVE

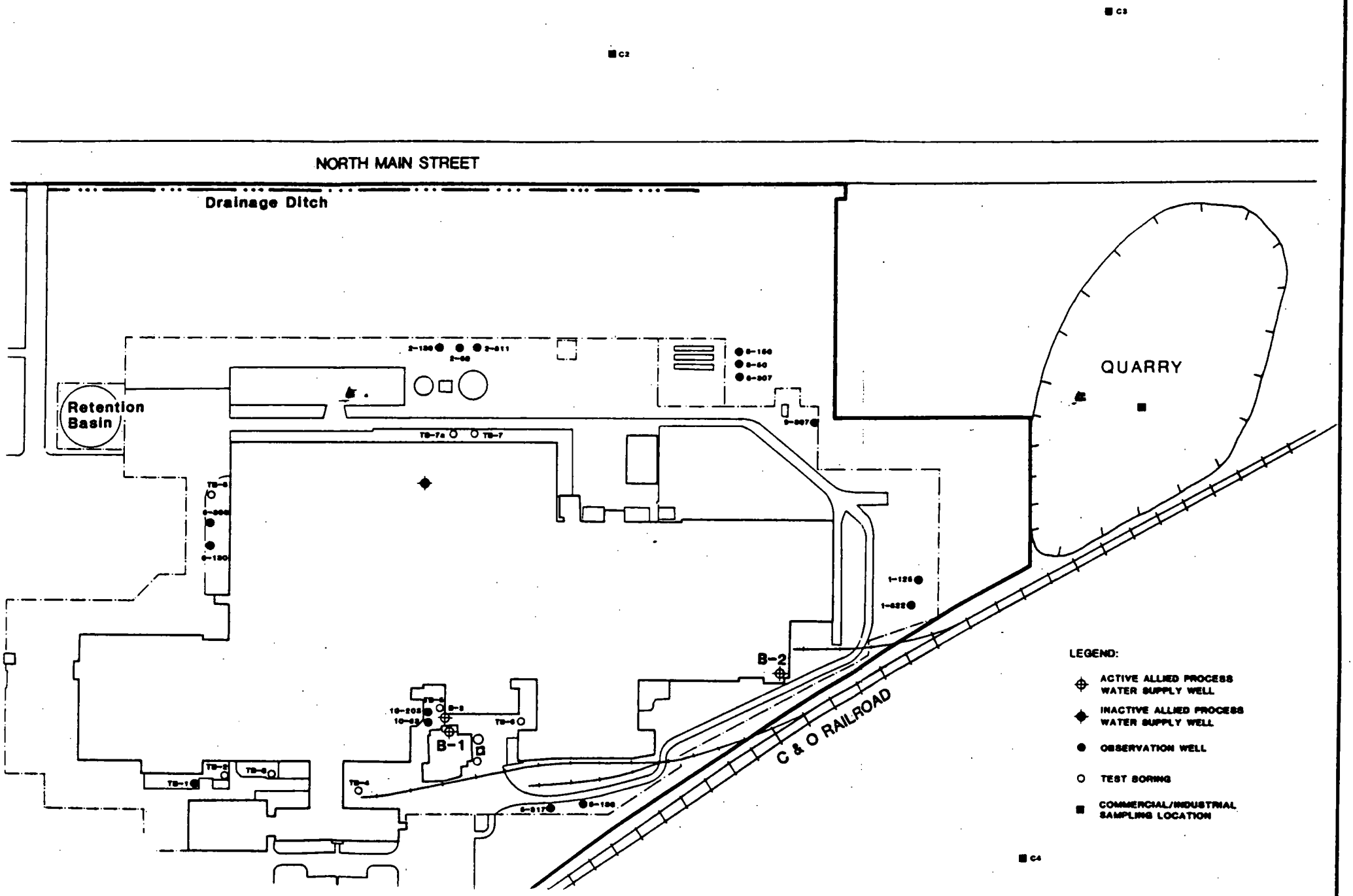
FOSTORIA, OHIO

FIGURE 1-1

SITE LOCATION

PROJ. # 41202 JUNE 8, 1985

T A GLEASON ASSOCIATES


C3
C2
NORTH MAIN STREET
Drainage Ditch
Retention Basin
QUARRY
B-1
B-2
C & O RAILROAD
C4
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION

2.0 SUMMARY OF FINDINGS

Presented herein is a summary of our findings based upon the information and investigations presented in subsequent sections. Detailed discussions and data are presented in appendices to this report.

2.1 GEOLOGY SUMMARY OF FINDINGS

A detailed report of the geology of the area is presented in Appendix A. Fostoria, Ohio, is located near the crest of the Findlay Arch in northwestern Ohio (Figure 2-1). This arch is a structural high bordered by basins to the east, north and southwest. The bedrock in the Fostoria area is a dolomite that is most likely the Middle Silurian Lockport Dolomite (Figure 2-2). The Lockport Dolomite is approximately 300 feet thick in the vicinity of Fostoria. The bedrock is overlain by a thin mantle of rather impermeable glacial till. The Lockport Dolomite is underlain by the Rochester Shale.

The Lockport Dolomite was formed by the deposition of carbonate sediments in a shallow Paleozoic sea. These carbonate sediments were gradually consolidated into limestone, which was then altered to dolomite. When sea level fell sufficiently for the dolomite to become subaerially exposed, porosity was developed in the rocks by the accumulation and movement of fresh groundwater from precipitation. Fostoria's location near the crest of the Findlay Arch allowed it to become emergent above sea level numerous times through geologic history, thus supporting more extensive porosity development than in the surrounding basins. However, much of the porous rock was eroded from the crest of the arch, leaving the thickest accumulations of porous rock on the flanks of the arch.

Examination of one core and cuttings from the on-site monitor wells reveal three facies in the Lockport Dolomite:

1. An upper light-gray to light-brown microcrystalline dolomite with numerous horizontal fractures and associated solution cavities

2. A middle beige sucrosic dolomite that has a varying amount of secondary intercrystalline porosity and minor amounts of primary intergranular porosity

3. A lower medium- to dark-gray mottled dolomite containing minor amounts of pyrite.

The upper facies has the best porosity development, while the lower facies does not have much porosity. The porosity of the middle facies varies as evidenced by the well cuttings. Figure 2-3 shows the facies as interpreted from well cuttings for each deep well on site.

Evidence of solution channels in the Lockport was gathered from examination of cuttings and observations made while drilling such as a change in water flow or the dropping of the drill string (Figures 2-4 and 2-5). The solution channels and fractures detected with this evidence were not observed to be laterally continuous in the same horizontal plane. Although it is likely that while the horizontal fractures are continuous, dissolution along the fractures is not.

Examinations of a 44-foot continuous core taken from test boring 1 and examination of the walls of the quarry south of the Autolite site did not reveal significant vertical fractures.

2.2 GROUNDWATER HYDROLOGY SUMMARY

2.2.1 Aquifer

The only aquifer in the Fostoria area, as represented by the site investigations, is a carbonate aquifer, i.e., the Lockport Dolomite (Lockport Aquifer). Although the Lockport Dolomite is approximately 300 feet thick, the on-site data suggest that the most productive zones of the Lockport Aquifer are in the upper facies, i.e., upper 150 to 175 feet. Most of the water flow is through solution channels and horizontal fractures of the upper facies, with the intercrystalline and intergranular porosity of the middle facies contributing a smaller volume of water. The Lockport Aquifer is a diffuse-flow aquifer, meaning that water flow is along many joints, fractures and solution channels that are in hydraulic communication. Flow is not restricted to a few isolated channels as in the karst terrain of eastern Tennessee. As a result of the good hydraulic communication, the water table at Fostoria is well defined.

At the site, the Lockport Aquifer underlies a thin (less than 10 feet thick) mantle of glacial till and/or fill. The depth to groundwater is approximately 10 feet, or just below the bedrock surface, although this may vary locally due to pumping.

2.2.2 Flow

Groundwater flow in northwestern Ohio is generally to the north (Figure 2-6). The piezometric surface generally conforms to the structural configuration of the area. In the vicinity of Fostoria, the flow is to the northwest, but was influenced by at least three areas of groundwater discharge on 12/28/84 and 1/30/85 (see Figure 2-7 and 2-8 and Drawings 1 and 2). The first area, southwest of Autolite's facility, includes three city wells

and several industrial wells; the second area includes the two Autolite wells, Roppe Rubber, Fostoria Industries, and literally hundreds of residential wells. The third area includes Buckeye Alluminum. Note that the equipotential lines are estimated from a limited number of groundwater elevation control points.

Groundwater flow at the site was assessed during the normal pumping and recovery of on-site wells B-1 and B-2 during November 1984 and before and during the B-3 pump test in April 1985. Figures 2-9, 2-10 and 2-11 show that "normal" pumping activities at the site maintain a cone of influence centered near wells B-1 and B-2.

Figures 2-12 and 2-13 show the cone of influence before and at the completion of the 92-hour pump test.

In summary, we conclude that during periods of normal pumping, the on-site wells B-1 and B-2 produce cones of influence which extend to or beyond the property lines of the Autolite facility. These cones of influence direct the groundwater flow towards wells B-1 and B-2.

2.2.3 Aquifer Characteristics

In order to assess aquifer characteristics at the Autolite site, a 92-hour pump test was performed April 13 through 17, 1985, with the B-3 well as the pumping well. Based on time-drawdown and distance-drawdown analyses, we find that the calculated transmissivity (T) varied from approximately 6,000 to 48,000 gpd/ft with an average value of approximately 17,000 gpd/ft. The calculated storage coefficient (S) varied from .01 to .36 with an average value of approximately .03.

Based upon this value of S, we conclude that the aquifer is unconfined, i.e. it is a water table aquifer.

Based upon a aquifer thickness of 150 feet and T of 17,00 gpd/ft the calculated hydraulic conductivity, K, is approximately 15 ft/day.

Darcy's flow velocity, assuming a hydraulic gradient of .001, porosity of .10 and K of 15 ft/day calculates to be approximately .15 ft/day or approximately 55 ft/year. Higher hydraulic gradients in the area of pumping wells, as shown in Figure 2-13, could increase flow velocities by one to two orders of magnitude.

2.2.4 Groundwater Use

The Lockport Aquifer in the Fostoria area supplies domestic, commercial and industrial users. Most of the residences within the Fostoria city limits are connected to the city of Fostoria water supply and distribution system. However, many of these residence also have a well on their property. A complete inventory of these wells relative to location, depth and use has not been performed. The major portion of the city water supply is from the Portage river, but city wells developed in the Lockport Aquifer supply water to the reservoirs during periods of low river flow.

Most residences outside the city limits obtain their water supply from wells on their property. These wells are developed at various depths in the Lockport Aquifer. A complete inventory of these wells has not been performed.

Several commercial/industrial wells were indentified, and are located at Drawings 1 and 2.[1]

[1]Drawings are attached at the end of this report within a plastic sleeve.

2.3 CONTAMINANT SOURCES AND PLUME(S) DELINEATION

2.3.1 Near-Site Contaminant Plume(s)

Figure 2-14 shows the location of on-site and near-site wells, the range of total VOC concentrations (ppb) sampled in each well and isoconcentration lines estimating the areal extent of the plume. Figure 2-14 shows that the highest VOC concentrations were sampled near Autolite well B-1, 21,428 ppb, and in Fostoria Industries' well C3, 20,708 ppb. The near-site groundwater flow system represented during normal pumping-recovery of wells B-1 and B-2 (Figure 2-12), shows that the direction of groundwater flow and contaminant transport is toward wells B-1 and B-2. Based on the flow system and the estimated VOC plume, we conclude that there may be at least four major VOC sources:

1 - On-site source(s) near well B-1 (see Figure 2-15) and/or the inactive on-site well

2 - Off-site source(s) near Fostoria Industries' well C3

3 - Off-site quarry

4 - Off-site source(s) near Roppe Rubber well C4

Based on the direction of flow and transport, i.e., toward B-1 and B-2, how can we explain the presence of VOC at monitor well locations upgradient of wells B-1 and B-2; i.e., well locations 3, 4, 6 and TB-1?

The following scenarios are presented to explain the possible reason(s) for sampling VOC north of well B-1:

One, the VOC sampled at locations 6 and 3 could be from other on-site sources (see Figure 2-15):

- Former reservoir and/or drainage ditches
- Active retention basin and/or underground pipes

Two, the VOC sampled at locations north of B-1 could be from transport to the north during the times that B-1 and B-2 were not pumping. Pumping records show that both wells were idle from October 1976 to January 1977. B-1 was idle from mid 1974 through mid 1977, and there may have been other periods of non-pumping prior to 1964, the first year that pumping records were available (see Section 4, Task 1, Site History).

Also, the VOC sampled at locations north of B-1 could be from unidentified off-site sources near Autolite, which are/were transported toward Autolite due to B-1 and B-2 pumping.

2.3.2 Off-Site Contaminant Plume(s)

South of Autolite

One sampling of 12 residential wells and 6 commercial wells located to the south, southeast and southwest of Autolite (see Drawing 4 and Figure 2-16) detected VOC in the Fostoria Industries' well C3, the Roppe Rubber well C4 and the Dollar General Store well C5. None of the other wells sampled VOC, except that two residential wells sampled trihalomethanes, the source of which was the city water supply as discussed in Section 4, Task 9.

North of Autolite

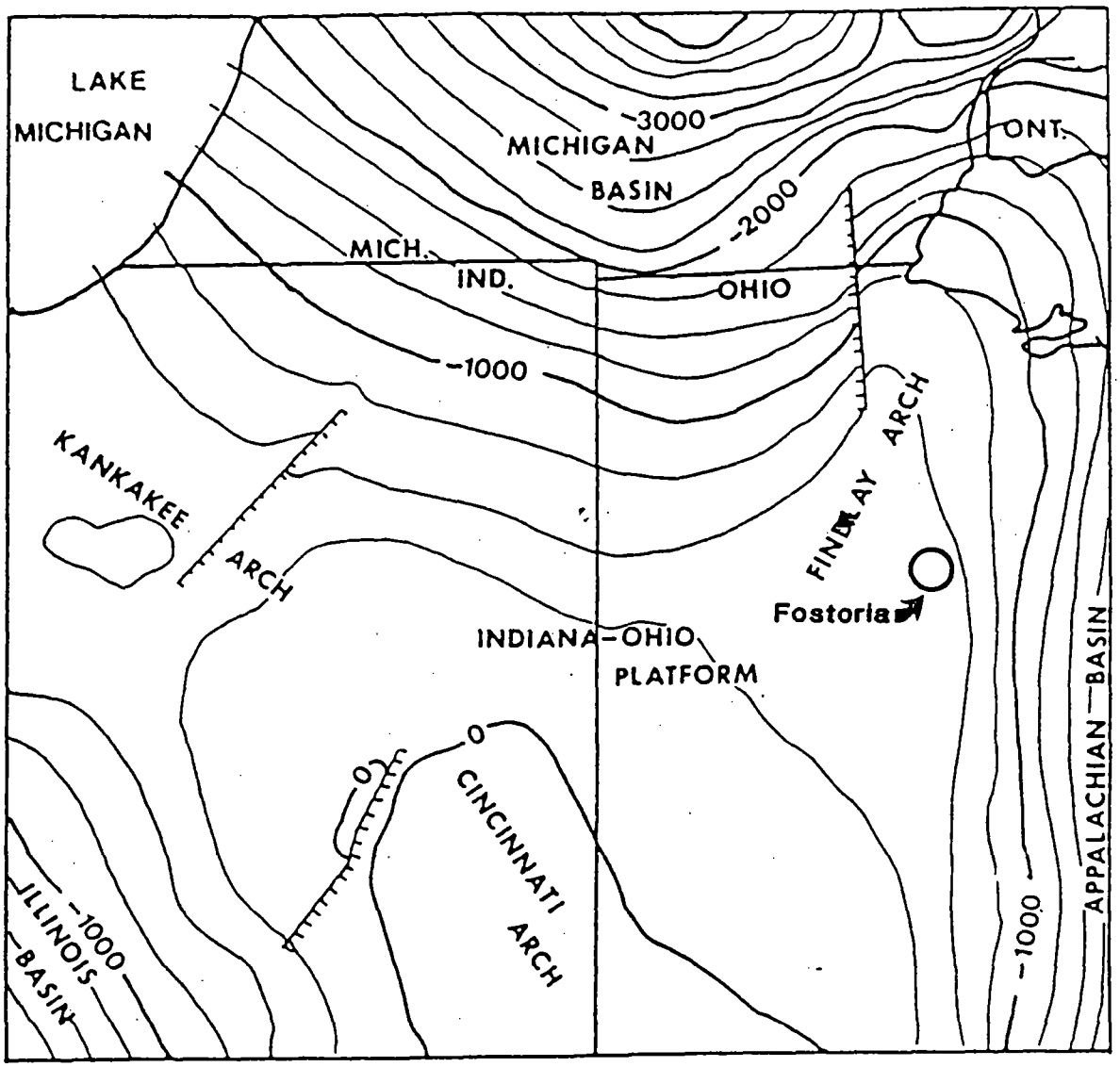
Figure 2-17 shows the highest total VOC concentration sampled in off-site residential and commercial wells. Figure 2-17 shows that of 78 residential wells sampled, 18 have sampled VOC. (Based on Howard Labs analytical results.)

The highest VOC concentration sampled in a residential well was 52 ppb[1], and of the 18 wells detecting VOC, only 2 detected VOC concentrations more than 20 ppb. Further, of the 18 wells detecting VOC, 3 sampled only tetrachloroethene, a commonly used dry cleaning solvent which was also sampled at 162 ppb in well C5, Dollar General Store.

Based on the sampling evidence, we find that there is no clearly delineated VOC plume. The greatest VOC density was in the area adjacent to the drainage ditch on the east side of Walnut Street, where 9 residential wells of 15 sampled, i.e., 60 percent, detected VOC (see Figure 2-17). The range of total VOC concentration was 1 to 52 ppb and the median concentration was 4 ppb. In this area, highlighted on Figure 2-17, the major VOC constituent was trichloroethene, TCE.

Figure 2-17 also shows the location of three sampling locations in the drainage ditch. Sediment and water samples from these three locations were analyzed for VOC. The water sample near Jones Road showed 17 ppb total VOC, but no detectable concentrations of VOC were found in the other samples.

[1]Split sample analyzed by Aqua Tech reported 20 ppb (see Table 4-16).



CONTOUR INTERVAL: 250 FEET

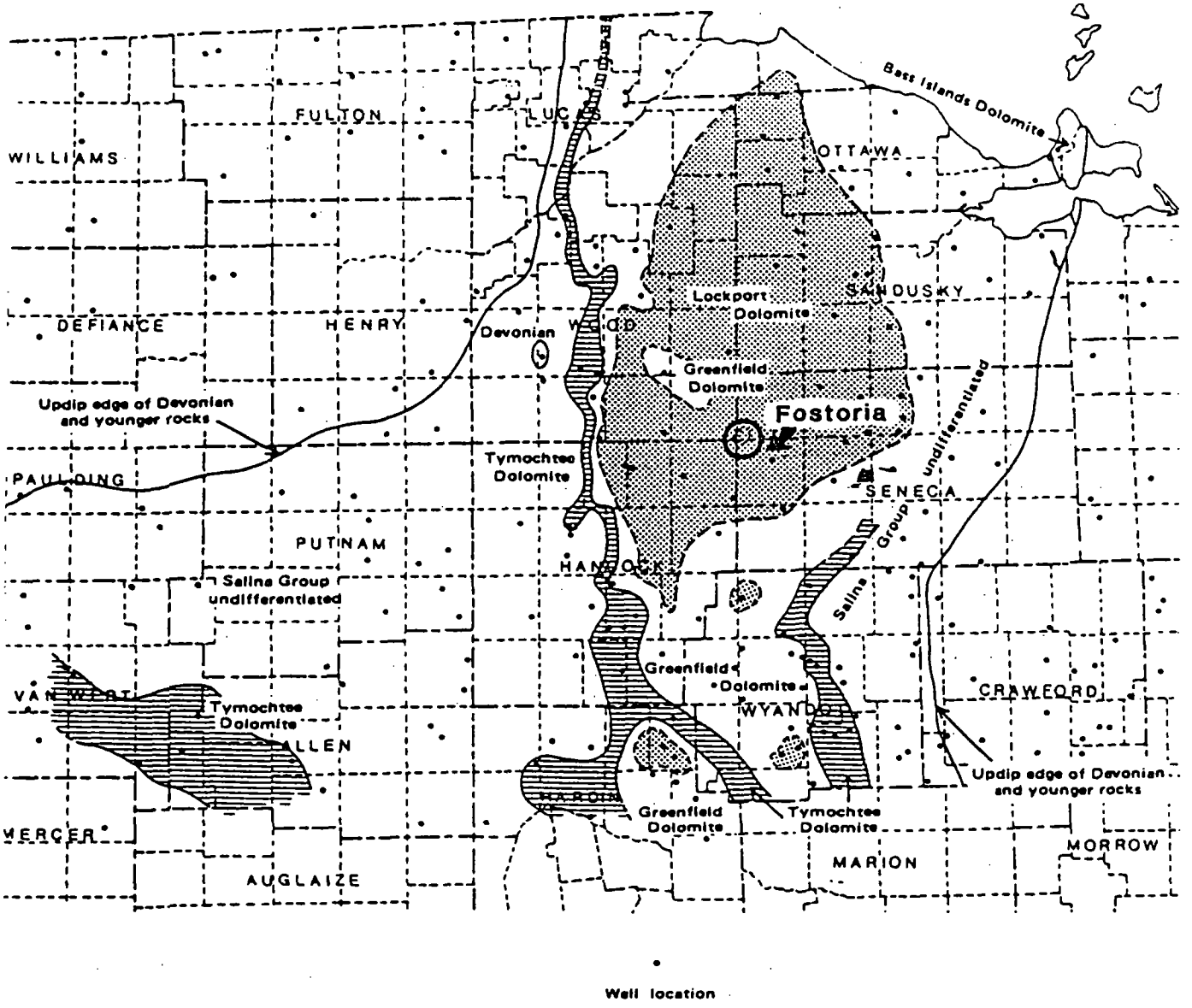
Source: Shaver, 1974

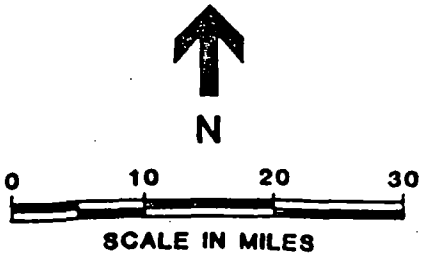
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-1
STRUCTURE CONTOURS
ON TOP OF
TRENTON FORMATION

PROJ. # 41202 MAY 17, 1985

T A GLEASON ASSOCIATES





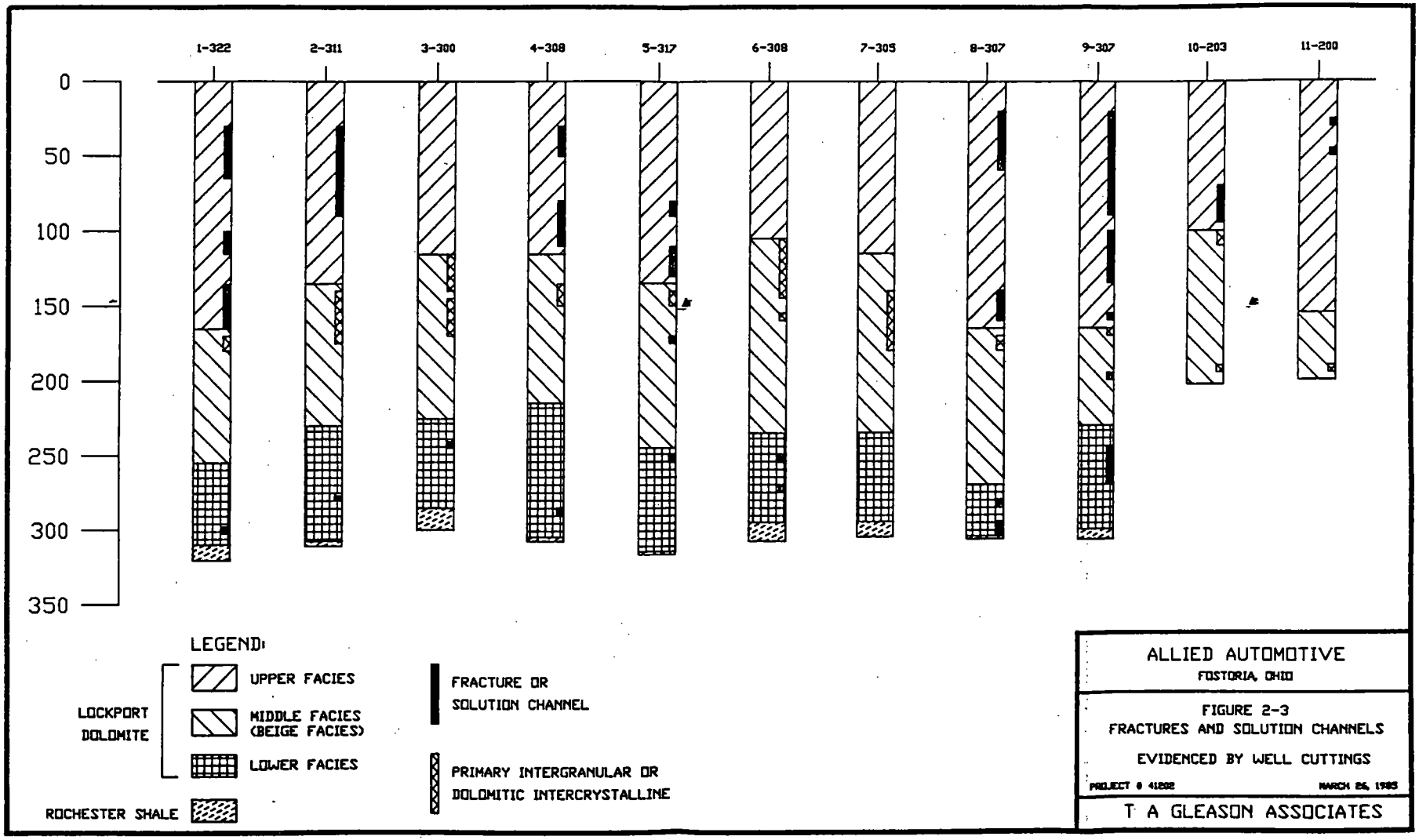
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

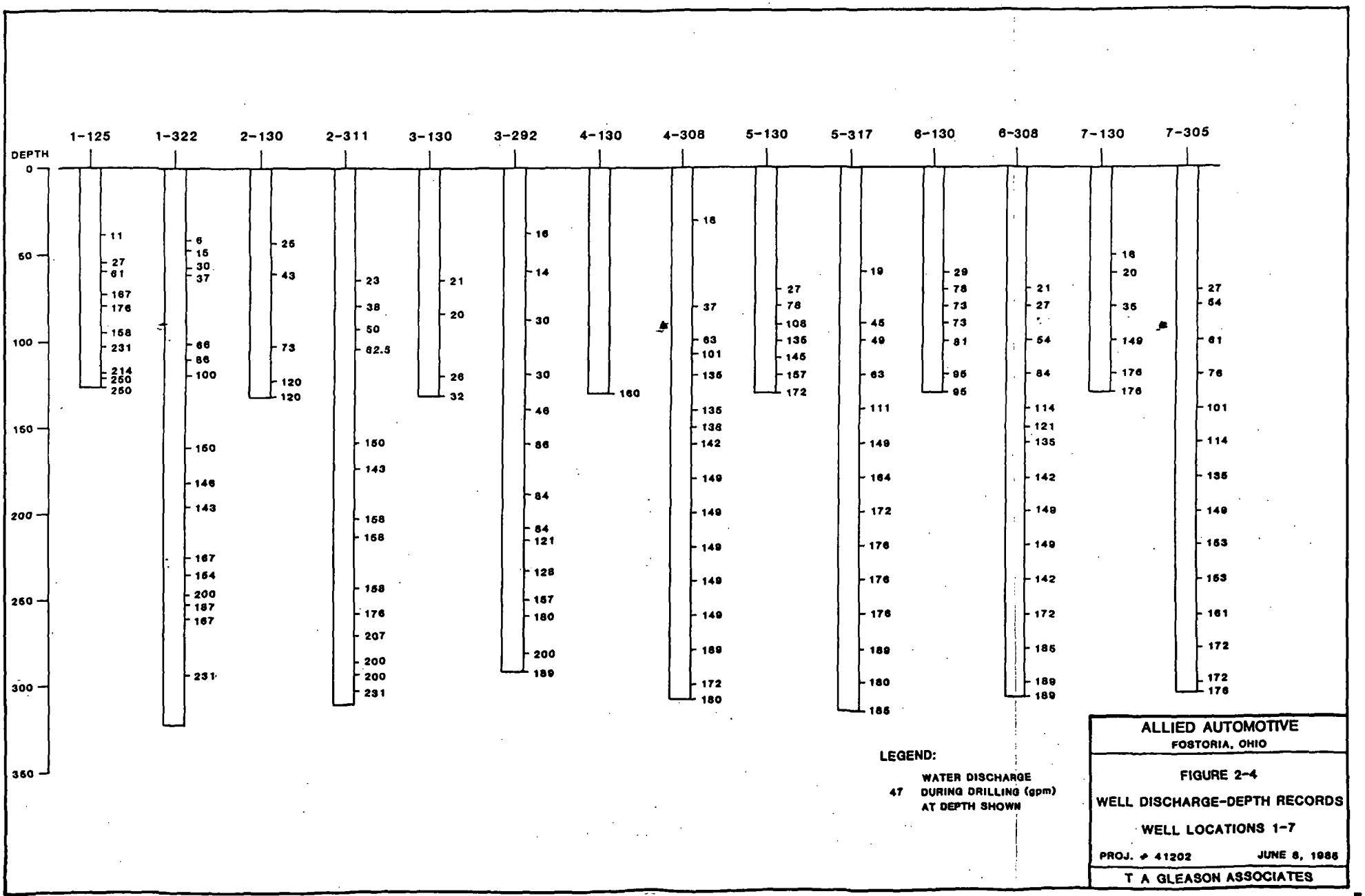
FIGURE 2-2

SILURIAN BEDROCK GEOLOGY OF NORTHWESTERN OHIO

PROJ. # 41202 MAY 23, 1986

T A GLEASON ASSOCIATES


1-322
2-311
3-300
4-308
5-317
6-308
7-305
8-307
9-307
10-203
11-200
0
50
100
150
200
250
300
350
LEGEND:
LOCKPORT DOLOMITE
UPPER FACIES
MIDDLE FACIES (BEIGE FACIES)
LOWER FACIES
ROCHESTER SHALE
FRACTURE OR SOLUTION CHANNEL
PRIMARY INTERGRANULAR OR DOLOMITIC INTERCRYSTALLINE
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-3
FRACTURES AND SOLUTION CHANNELS
EVIDENCED BY WELL CUTTINGS
PROJECT # 41202
MARCH 26, 1985
T A GLEASON ASSOCIATES



LEGEND:

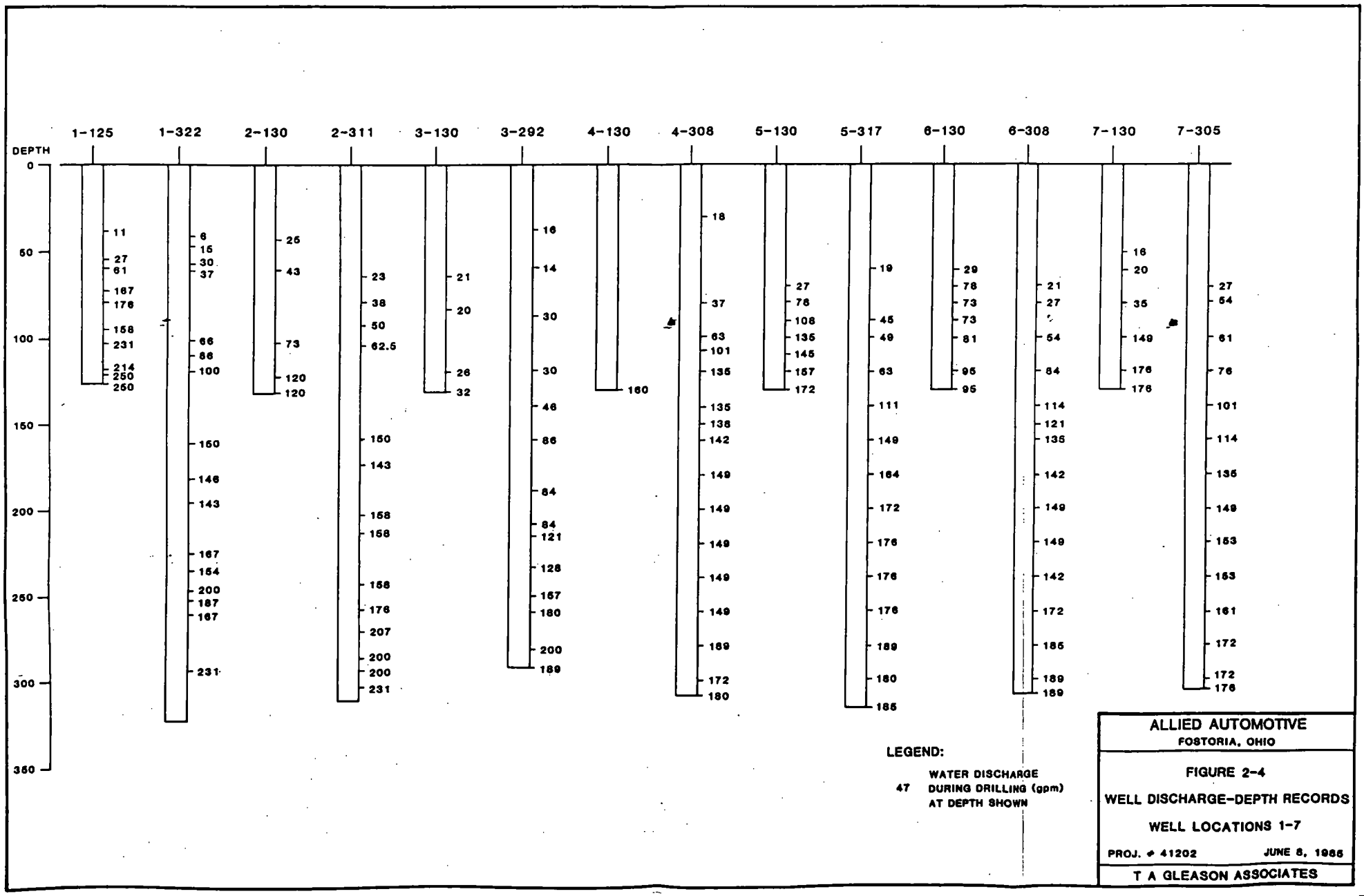
47 WATER DISCHARGE DURING DRILLING (gpm) AT DEPTH SHOWN

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-4
WELL DISCHARGE-DEPTH RECORDS
WELL LOCATIONS 1-7

PROJ. # 41202 JUNE 6, 1986

T A GLEASON ASSOCIATES



LEGEND:

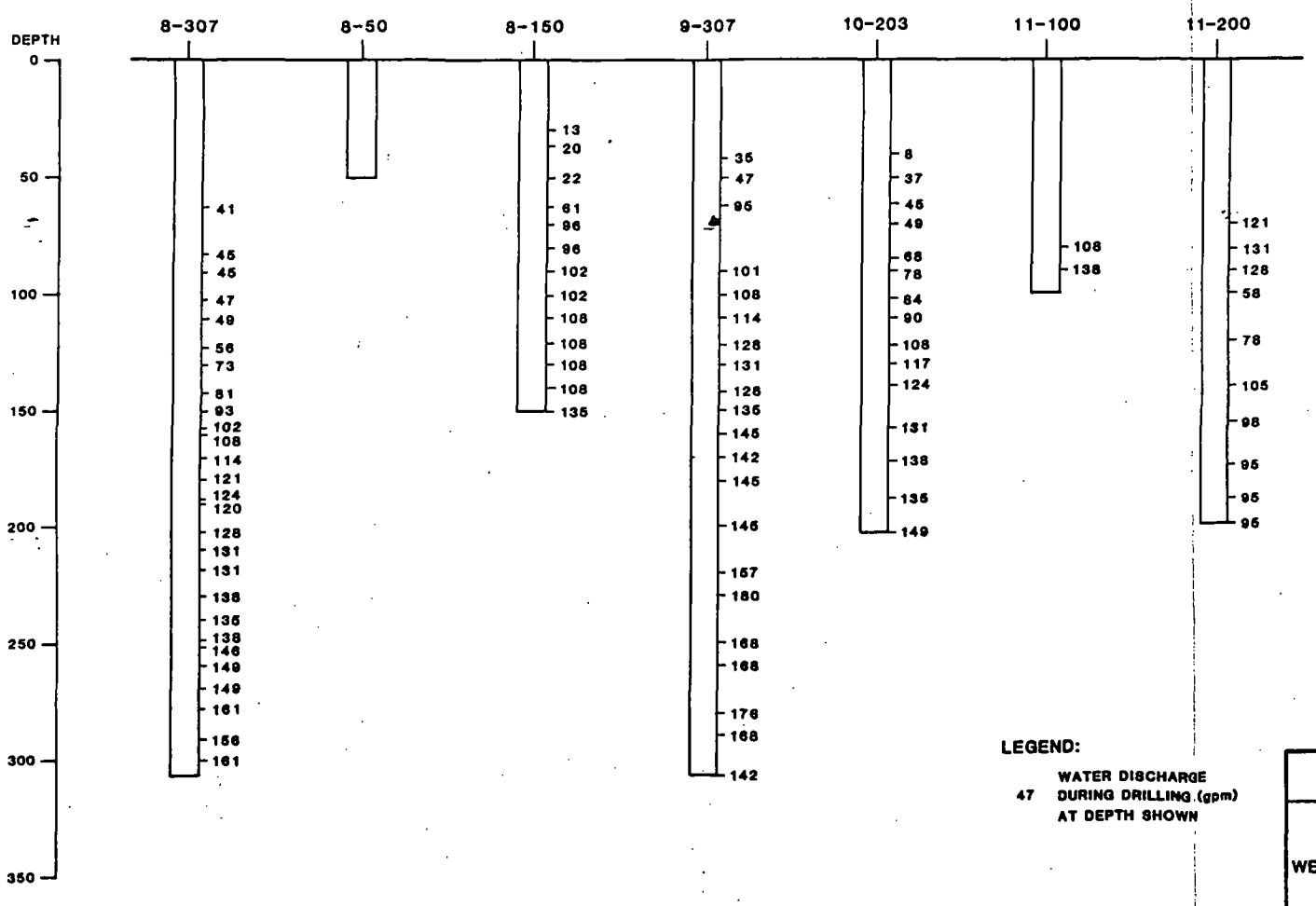
47 WATER DISCHARGE DURING DRILLING (gpm) AT DEPTH SHOWN

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-4
WELL DISCHARGE-DEPTH RECORDS
WELL LOCATIONS 1-7

PROJ. # 41202 JUNE 6, 1985

T A GLEASON ASSOCIATES



LEGEND:

47 WATER DISCHARGE DURING DRILLING (gpm) AT DEPTH SHOWN

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

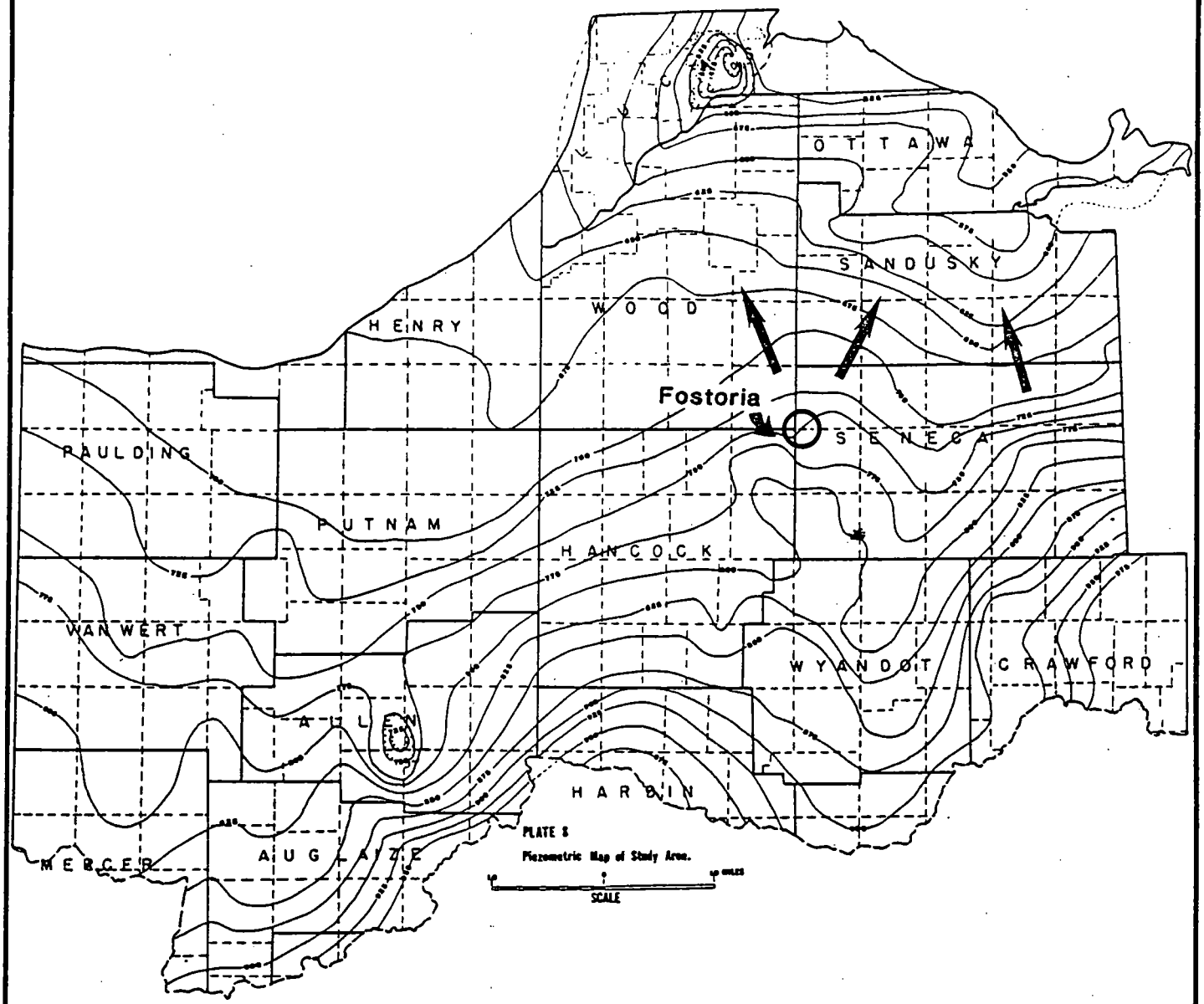
FIGURE 2-5

WELL DISCHARGE-DEPTH RECORDS

WELL LOCATIONS 8-11

PROJ. # 41202 JUNE 8, 1988

T A GLEASON ASSOCIATES



EXPLANATION

Piezometric Contour
Contour Interval: 25 Feet
Datum: Mean Sea Level

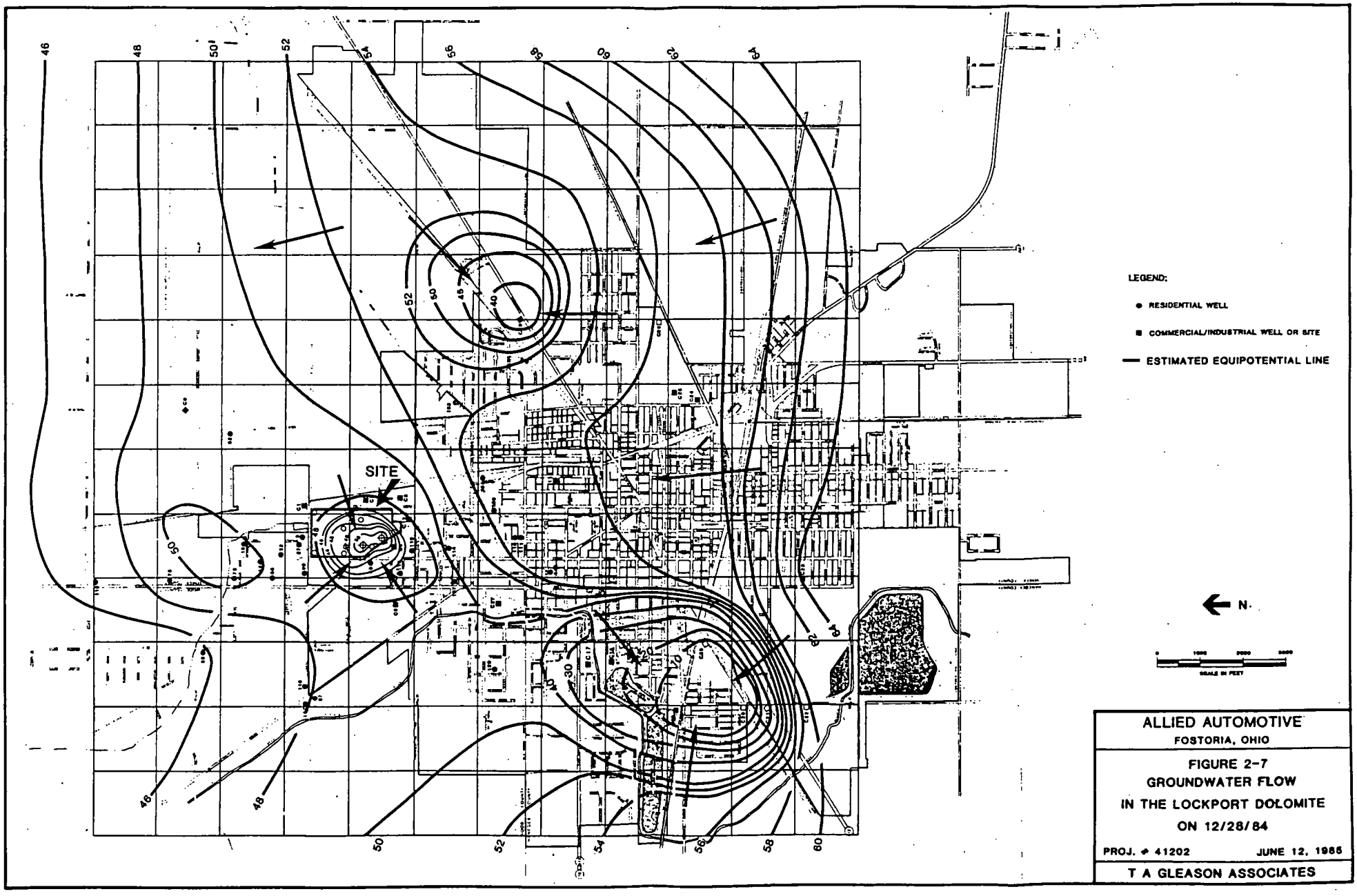
0 10 20
SCALE IN MILES

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-6
PIEZOMETRIC MAP
OF STUDY AREA
1970

PROJ. # 41202 JUNE 7, 1985

T A GLEASON ASSOCIATES

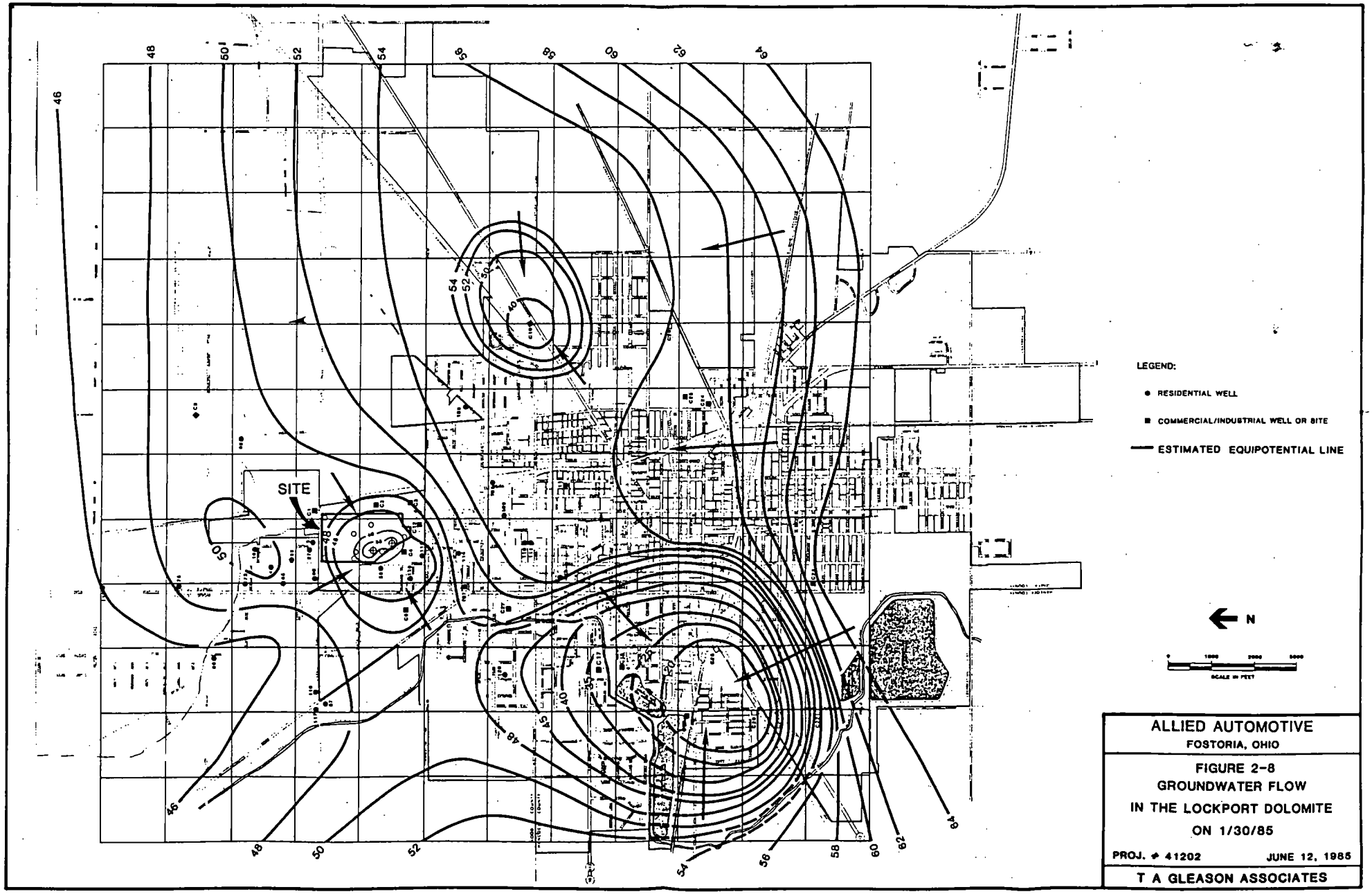


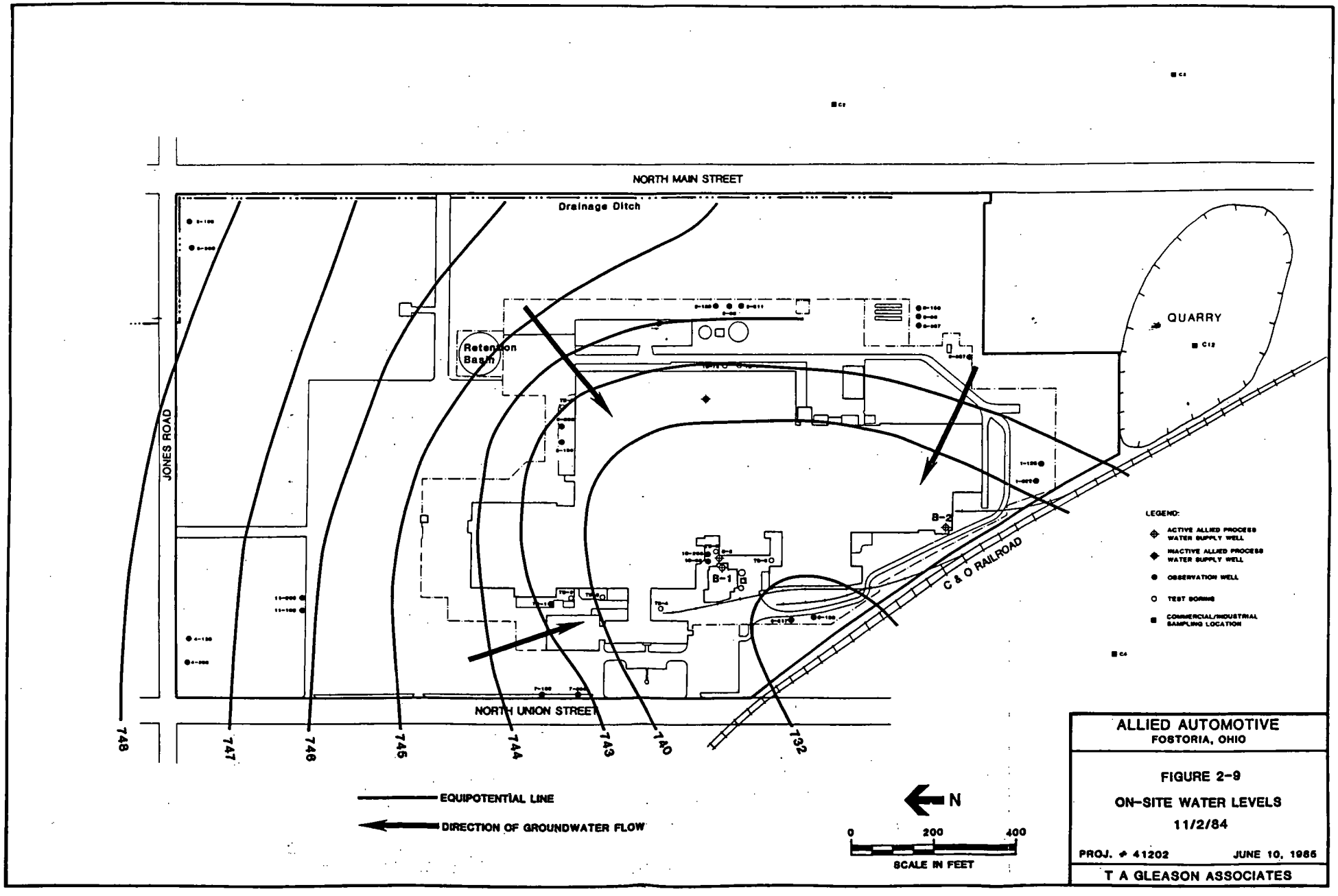
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

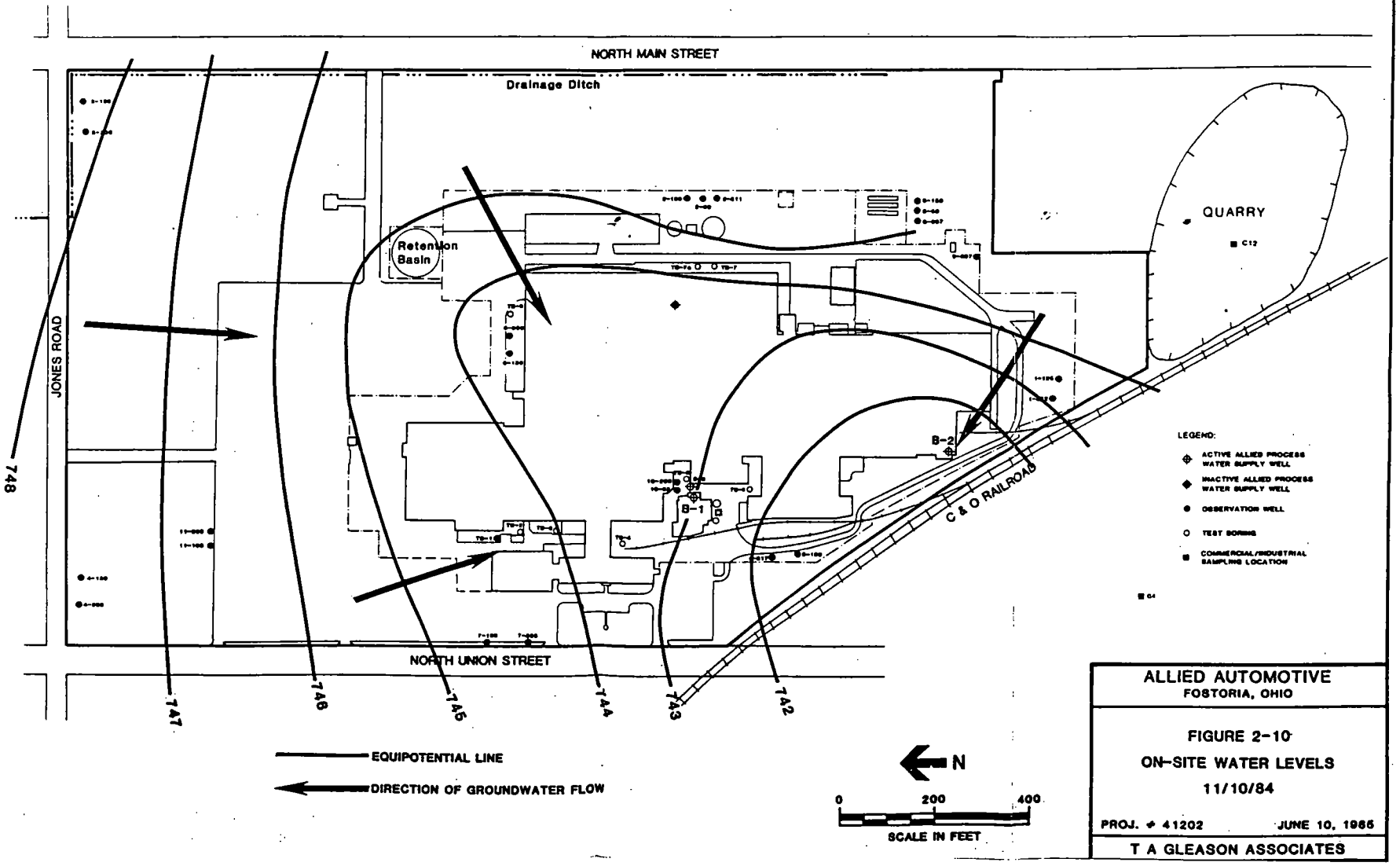
FIGURE 2-7
GROUNDWATER FLOW
IN THE LOCKPORT DOLOMITE
ON 12/28/84

PROJ. # 41202 JUNE 12, 1985

T A GLEASON ASSOCIATES


SITE
LEGEND:
RESIDENTIAL WELL
COMMERCIAL/INDUSTRIAL WELL OR SITE
ESTIMATED EQUIPOTENTIAL LINE
N
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-8
GROUNDWATER FLOW
IN THE LOCKPORT DOLOMITE
ON 1/30/85
PROJ. # 41202
JUNE 12, 1985
T A GLEASON ASSOCIATES


NORTH MAIN STREET
Drainage Ditch
JONES ROAD
Retention Basin
QUARRY
B-1
B-2
C & O RAILROAD
NORTH UNION STREET
748
747
746
745
744
743
740
732
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION
EQUIPOTENTIAL LINE
DIRECTION OF GROUNDWATER FLOW
N
0
200
400
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-9
ON-SITE WATER LEVELS
11/2/84
PROJ. # 41202
JUNE 10, 1985
T A GLEASON ASSOCIATES

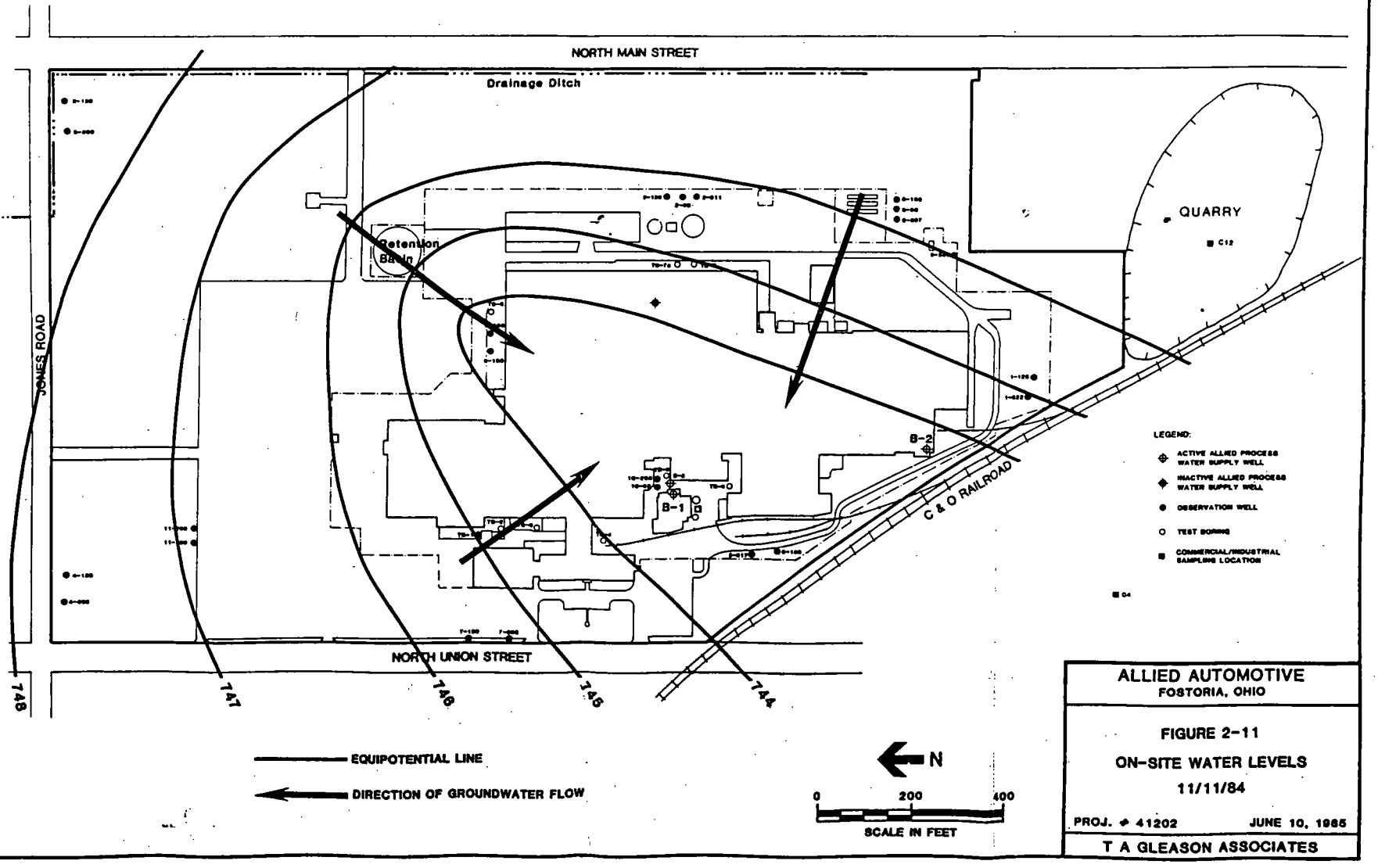


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-10
ON-SITE WATER LEVELS
11/10/84

PROJ. # 41202 JUNE 10, 1985

T A GLEASON ASSOCIATES

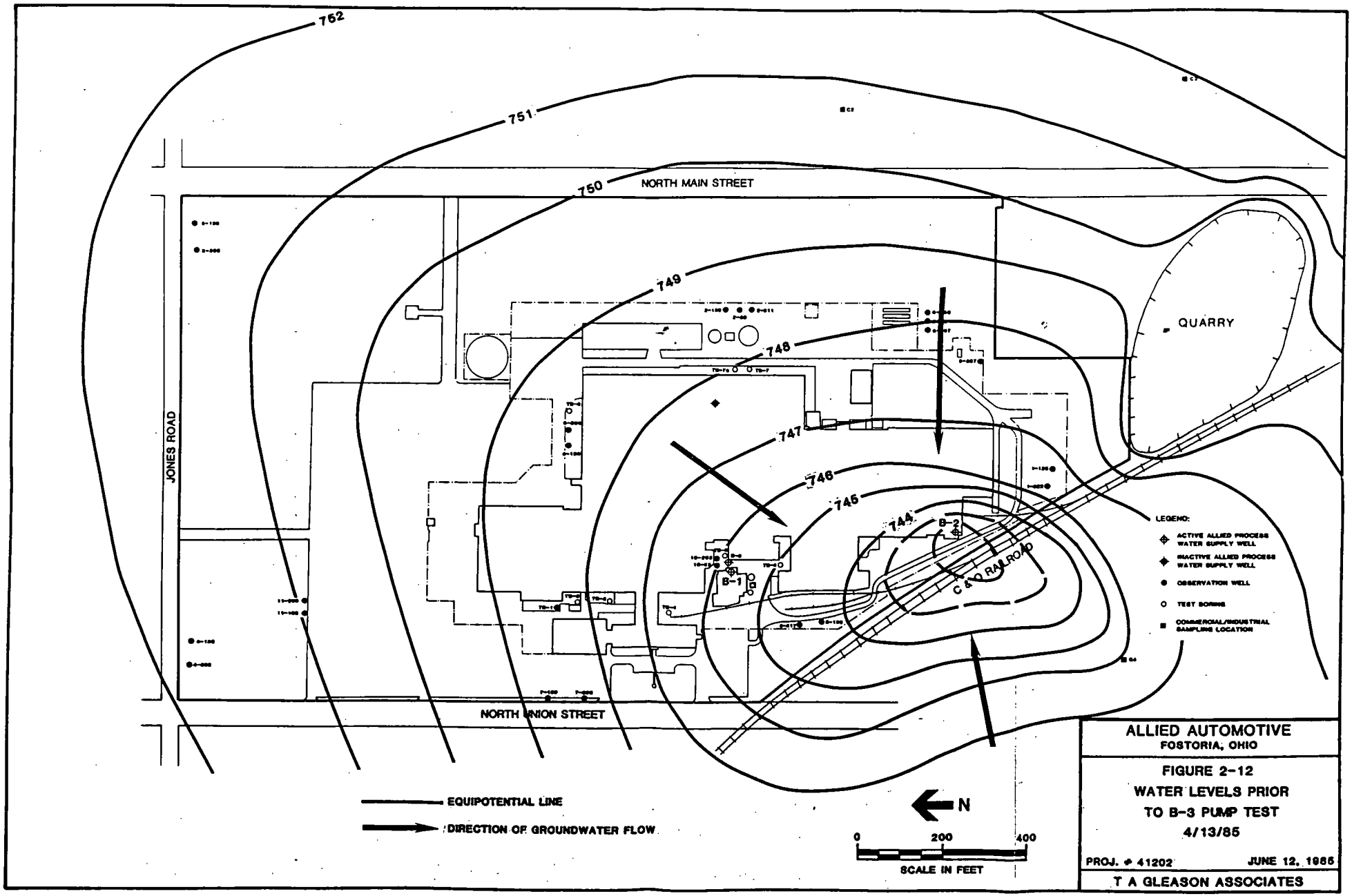


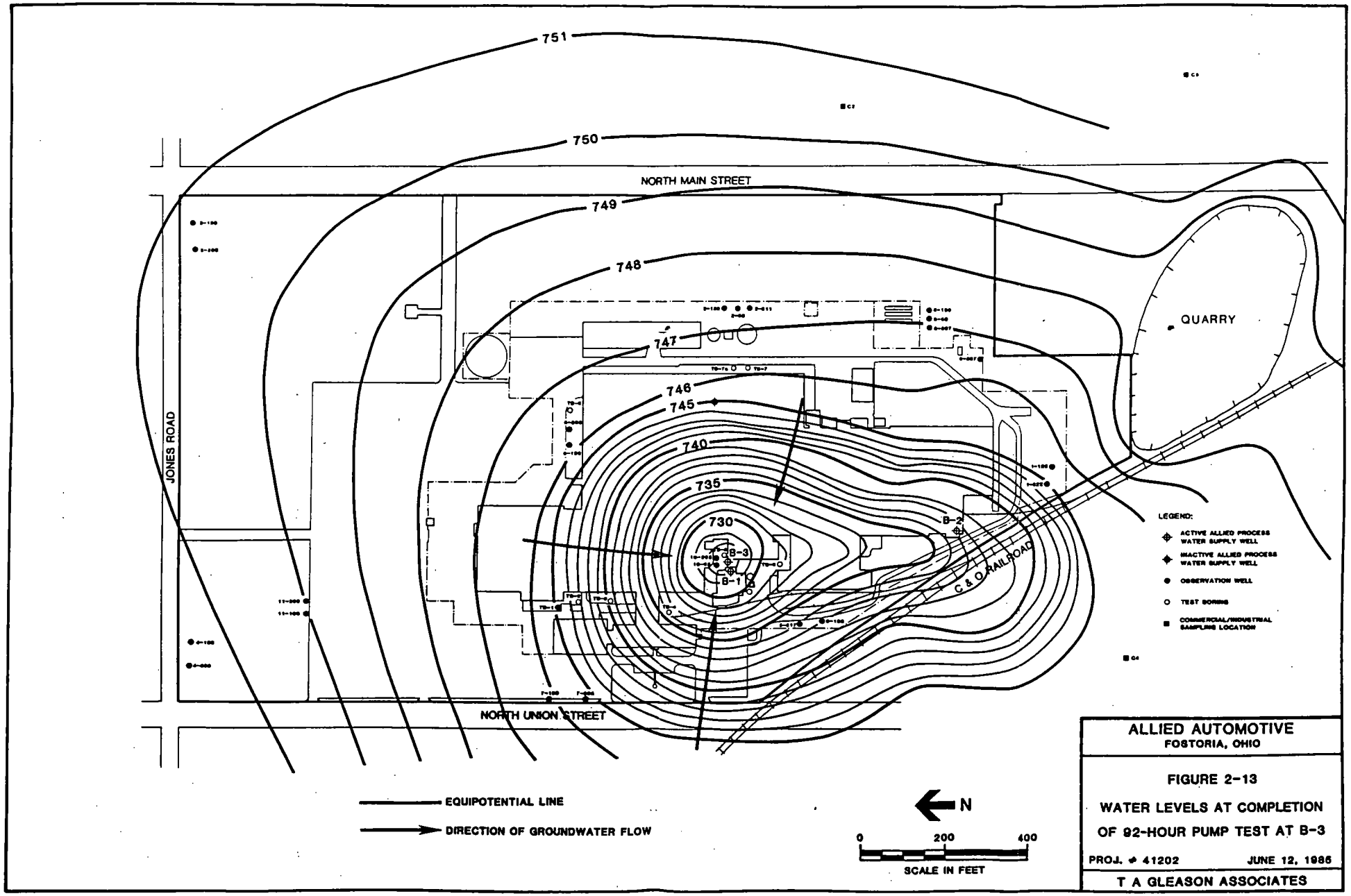
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-11
ON-SITE WATER LEVELS
11/11/84

PROJ. # 41202 JUNE 10, 1985

T A GLEASON ASSOCIATES


752
751
750
749
748
747
746
745
744
NORTH MAIN STREET
JONES ROAD
NORTH UNION STREET
QUARRY
B-1
B-2
C & O RAILROAD
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION
EQUIPOTENTIAL LINE
DIRECTION OF GROUNDWATER FLOW
N
0
200
400
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-12
WATER LEVELS PRIOR
TO B-3 PUMP TEST
4/13/85
PROJ. # 41202
JUNE 12, 1985
T A GLEASON ASSOCIATES

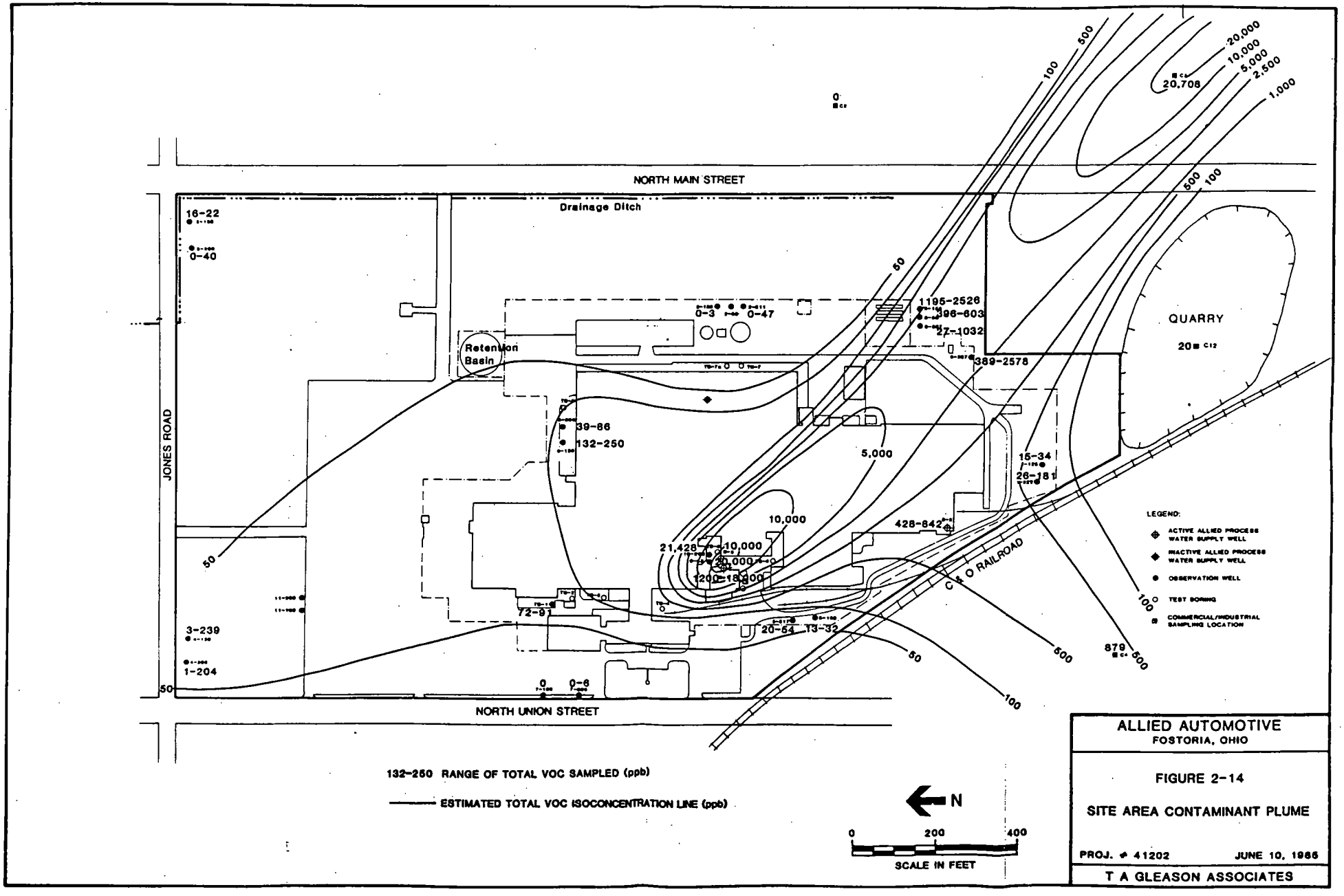


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-13
WATER LEVELS AT COMPLETION
OF 92-HOUR PUMP TEST AT B-3

PROJ. # 41202 JUNE 12, 1986

T A GLEASON ASSOCIATES



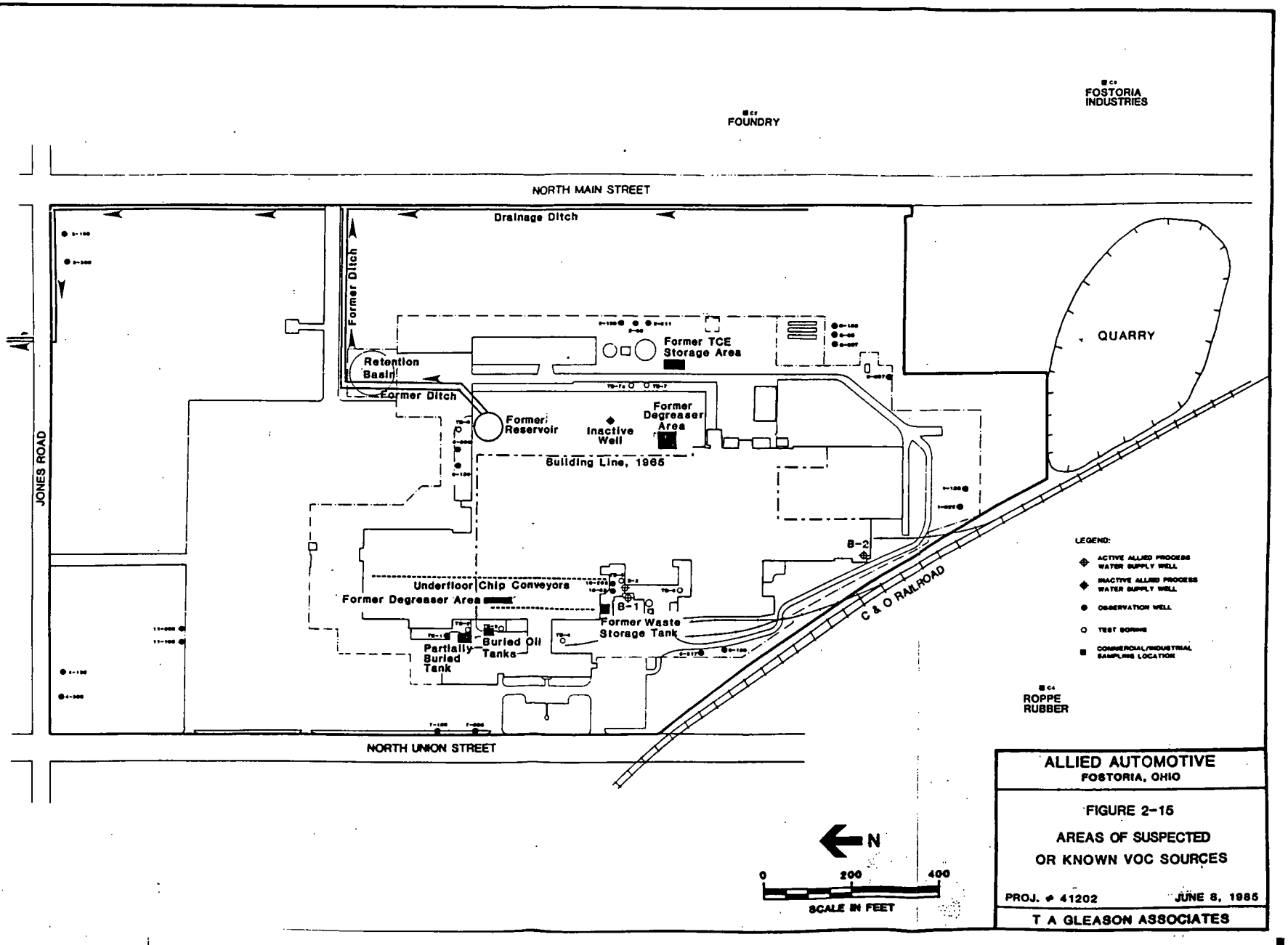
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

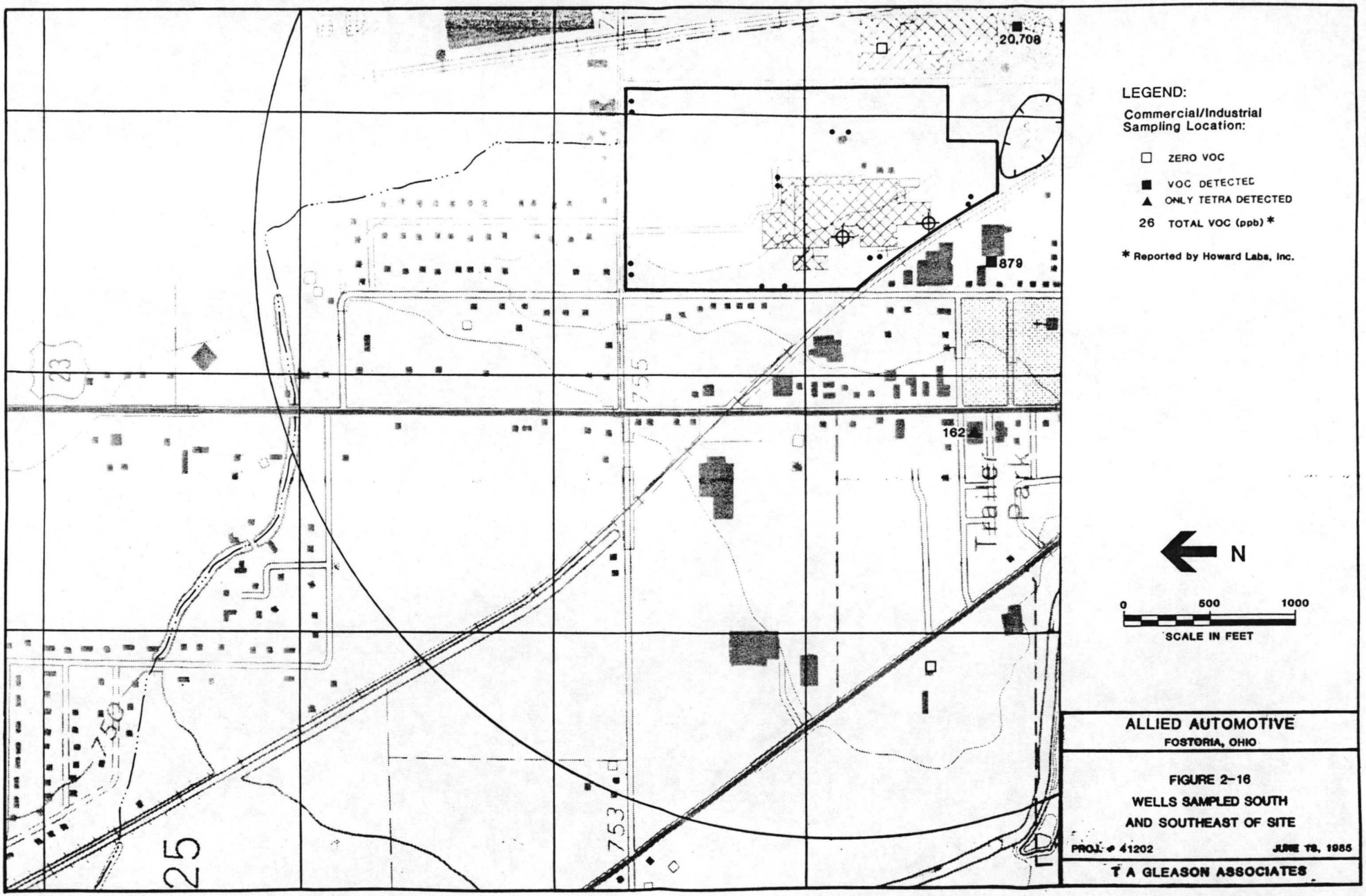
FIGURE 2-14

SITE AREA CONTAMINANT PLUME

PROJ. # 41202 JUNE 10, 1986

T A GLEASON ASSOCIATES


FOSTORIA INDUSTRIES
FOUNDRY
NORTH MAIN STREET
Drainage Ditch
Former Ditch
Retention Basin
Former Ditch
Former TCE Storage Area
Former Reservoir
Inactive Well
Former Degreaser Area
Building Line, 1965
QUARRY
JONES ROAD
B-2
Underfloor Chip Conveyors
Former Degreaser Area
B-1
Former Waste Storage Tank
Partially Buried Tank
Buried Oil Tanks
C & O RAILROAD
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION
ROPPE RUBBER
NORTH UNION STREET
N
0
200
400
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-15
AREAS OF SUSPECTED OR KNOWN VOC SOURCES
PROJ. # 41202
JUNE 8, 1985
T A GLEASON ASSOCIATES

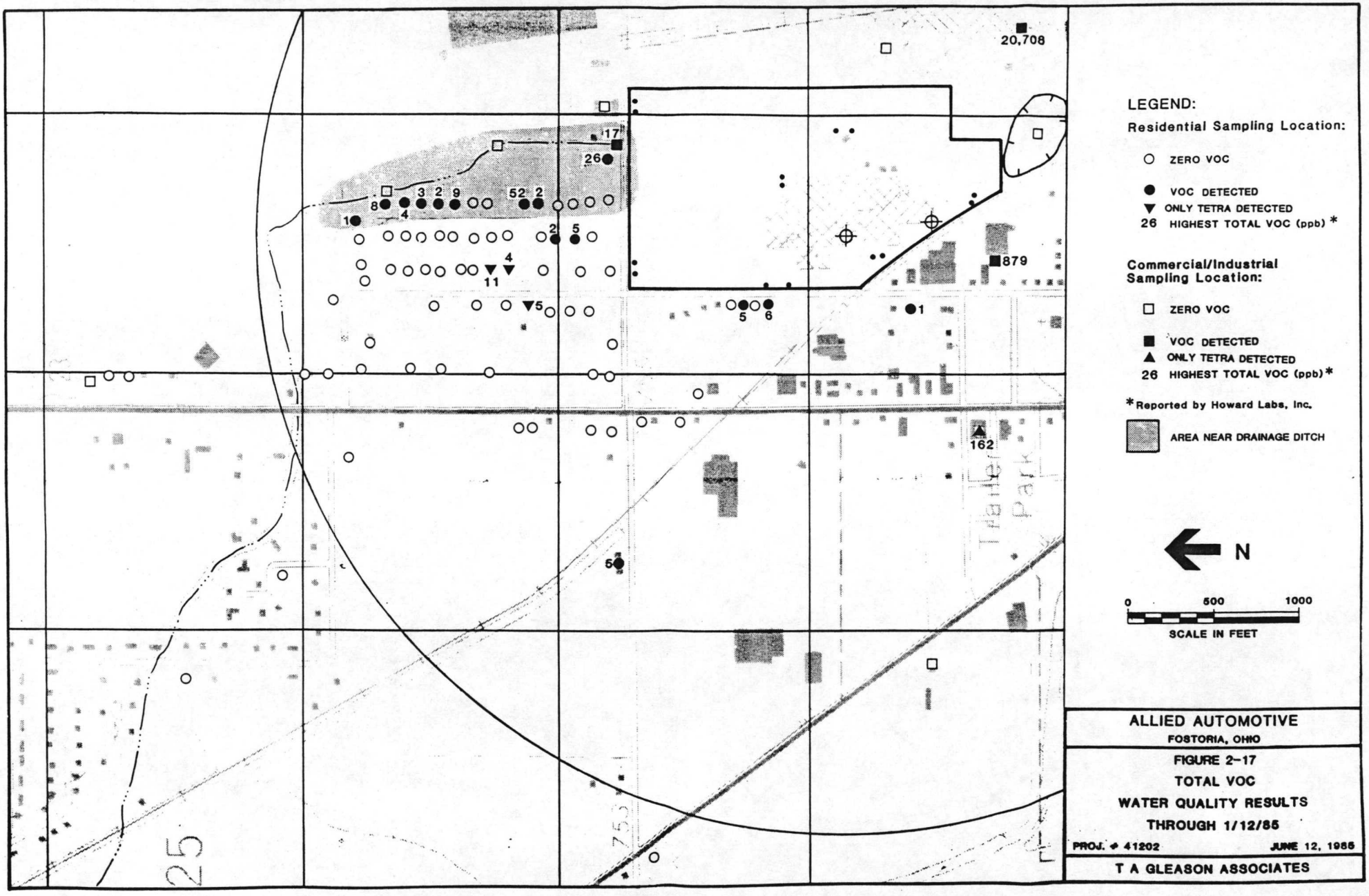


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 2-16
WELLS SAMPLED SOUTH
AND SOUTHEAST OF SITE

PROJ. # 41202 JUNE 18, 1985

T A GLEASON ASSOCIATES


20,708
17
26
8
3
2
9
52
2
1
4
2
5
4
11
5
5
6
1
879
162
5
Trailer Park
25
753
LEGEND:
Residential Sampling Location:
ZERO VOC
VOC DETECTED
ONLY TETRA DETECTED
26 HIGHEST TOTAL VOC (ppb) *
Commercial/Industrial Sampling Location:
ZERO VOC
VOC DETECTED
ONLY TETRA DETECTED
26 HIGHEST TOTAL VOC (ppb) *
*Reported by Howard Labs, Inc.
AREA NEAR DRAINAGE DITCH
N
0
500
1000
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 2-17
TOTAL VOC
WATER QUALITY RESULTS
THROUGH 1/12/85
PROJ. # 41202
JUNE 12, 1985
T A GLEASON ASSOCIATES

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 ON-SITE

3.1.1 Sources

Our findings indicate that there were several on-site potential sources which may have released VOC into the Lockport Aquifer over the past 30 years. Some of the potential VOC sources, e.g., solvent degreasers, solvent storage tanks, and distillation facilites were removed from use many years ago. However, spills, leaks, and/or discharges from those facilities could still be present in the soils/fill underlying the manufacturing areas. Other potential VOC sources, e.g., the stormwater/wastewater basin, discharge ditches, and abandoned well, were covered years ago, but could be actively leaking VOC into the underlying soils/fill. The underfloor chip conveyors are also a potential source of VOC transport to the soil/fill underlying the manufacturing area.

Recommendations

We recommend that additional investigations be performed to locate and characterize potential VOC sources in the manufacturing areas. Specifically, we recommend:

- Install test holes and obtain samples of the soils/fill/liquids recovered at selected locations in the manufacturing area near the potential sources shown in Figure 2-15
- Assess the quality and quantity of VOC present (if any)
- Identify ways to remove and/or mitigate the transport to the aquifer if any significant quantities of VOC are detected.

3.1.2 VOC Plume(s)

Our findings indicate that the on-site VOC plume is concentrated near well B-1 and appears to be contained by the pumping of B-1 and/or B-2. High VOC concentrations are also evident at well locations 8 and 9. Approximately 1 year of sampling data indicates that the concentrations at wells B-1 and B-2 are fairly persistent, whereas VOC concentrations at the on-site monitor wells have shown significant variation.

Recommendations

We recommend that the following actions be implemented:

- Pump wells B-1, B-2, B-3 and/or other on-site wells at a rate and frequency to assure continued containment of the plume.
- Measure and record water levels in selected monitor wells at monthly intervals to assess and document the groundwater flow system
- Sample selected on-site monitor wells and pumping wells on a quarterly basis to assess and document VOC concentrations

3.1.3 Discharge of Groundwater Containing VOC

Presently, Autolite's process water supply is obtained from Wells B-1 and B-2, which discharge approximately 100 gpm and 200 gpm respectively. The process effluent water is discharged to the City of Fostoria Treatment Plant. Recently installed Well B-3, can discharge in excess of 300 gpm, and is expected to contain the onsite VOC plume if pumped continually at that rate. However, the proposed maximum allowable concentration of total toxic organics (TTO) which can be discharged to the Fostoria Treatment System is 2.15 mg/l.

Based upon this discharge limitation and Autolite's intention to contain the VOC plume by pumping B-3, it will be necessary to remove VOC from the process water. We find that the most cost effective containment and treatment system would include the following:

- Use well B-3 (discharging at approximately 300 gpm) for process water supply and for plume containment.

- Install an air stripping column for B-3's discharge to remove VOC prior to use as process water, thus allowing the effluent to meet compliance with total toxic organic (TTO) pretreatment standards.

- An air stripping column capable of treating 300 gpm and removing over 99.9 percent of total VOC would be approximately 4 ft. in diameter and 35 ft. high. We recommend that a pilot study be performed at the site with B-3 discharge water as the design basis for a cost effective and efficient full-scale air stripper. In addition, we recommend the assessment of the impact (if any) of the air emmisions. The assessment to include treatability alternatives and costs.

3.2 OFF-SITE

3.2 Sources

At least three off-site areas of potential sources were identified:

Fostoria Industries area
Roppe Rubber area
Quarry located south of Autolite

These areas were identified on the basis of one water quality sampling and an assessment of the groundwater flow system, i.e., the areas were found to be upgradient of Autolite. As such, if these areas contain VOC sources, they could contribute to the VOC plume detected in Autolite wells.

Recommendations

We recommend that the identified areas be further assessed relative to their contribution of VOC to the aquifer. Because these sources are off-site, and involve other property owners and users, we have not identified a method by which these potential sources can be assessed. However, we are aware of and endorse Autolite's ongoing attempts to work with the former and current property owners to make the necessary assessments.

3.2.2 Contaminant Plume(s)

Except for the near-site plume identified in the area of Fostoria Industries and Roppe Rubber, we have not delineated an off-site VOC plume. However, we have identified an area north of Autolite near the drainage ditch where residential wells have sampled relatively low concentrations of VOC. Groundwater samples from these residential wells may not be representative of the aquifer, in that there is little if any information available on well construction, development, and sanitary protection. Because of these uncertainties, we conclude that the sampling data from these wells is inconclusive relative to delineation of water quality in the Lockport Aquifer.

Recommendations

We recommend that additional investigations be performed to assess the potential VOC sources, water quality and groundwater flow system north of Autolite by:

- Inventory and characterize the residential wells, i.e., depth, construction, development, and sanitary protection
- Install monitor wells and sample groundwater at selected locations
- Measure groundwater levels in residential wells and monitor wells to assess the groundwater flow system, i.e., depth, rate, and direction of groundwater flow
- Obtain samples of potential VOC sources, including the drainage ditch and residential sewage treatment/disposal systems

4.0 SUMMARY OF INVESTIGATIONS

To accomplish the project objectives described in Section 1.3, we identified and performed a series of tasks as itemized below:

1. Site History
2. Geological and Hydrological Reconnaissance
3. Field Surveys
4. Soil Sampling Program
5. Monitor Well Construction and Development
6. Hydraulic Testing
7. On-Site Water Quality Sampling and Analyses
8. Pump Test
9. Off-Site Water Quality Sampling and Analyses
10. Assessment of General Groundwater Flow in the Fostoria Area

Presented below is a summary of the investigations and findings for each task. Tasks 1 through 8 were part of our initial investigations; tasks 9 and 10 were added to include the assessment of off-site groundwater quality and groundwater flow.

TASK 1 - SITE HISTORY

The Autolite facility is located in the north end of Fostoria (Figure 1-1). Since 1936, the first year that spark plugs were manufactured here, the facility has grown and expanded. Drawing 3 and Figure 1-2 shows the location and identification of the existing Autolite facilities.

Potential On-Site VOC Sources

Figure 4-1, shows the location of items of particular interest to this investigation, including areas of potential on-site VOC sources which were identified by Autolite:

- The active water supply wells B-1, B-2 and the inactive well abondoned in 1966
- The tanks formerly used for trichloroethylene (TCE) storage, and other tanks west of the manufacturing building.
- The former reservoir and ditch.
- The existing retention basin and underground discharge line to the drainage ditch.
- The former degreaser areas.
- The underfloor chip conveyors.
- The former waste storage tank area.

The areas of potential VOC sources shown on Figure 4-1 were identified and located from drawings and documents furnished by Autolite and from information presented during meetings with present and former Autolite personnel.

On-Site Water Supply Wells

The location of the active on-site supply wells B-1 and B-2 are shown on Figure 4-1. Also located on Figure 4-1 is the water supply well abandoned in 1966, and the recently constructed supply well B-3, which is presently inactive.

We have not been able to find any information relative to the construction, development or operation of the abandoned well.

Construction and Development of B-1 and B-2

The well logs, pump data, and pumping records for B-1 and B-2 were obtained and analyzed to assess the effects of well discharge on groundwater flow, contaminant transport and plume(s) delineation. Table 4-1 presents a summary of well construction and development.

Well logs for wells B-1 and B-2 are presented in Appendix A.

Pumping Records for B-1 and B-2

Figures 4-2 and 4-3 present a summary of monthly pumping records for wells B-1 and B-2 for the years 1964 to 1985. Figures 4-2 and 4-3 show that when pumping, well B-1 generally discharged at an average rate ranging between 50 to 250 gpm and B-2 generally discharged at an average rate of 150 to 300 gpm until 1978, when average discharge ranged from 50 to 150 gpm.

Low Discharge Periods

Figures 4-2 and 4-3 also show that zero discharge was recorded for well B-1 for at least 1 month during 1970, 1971, 1974, 1975, 1976, 1977, 1978, 1980 and 1981; and zero discharge was recorded for well B-2 for at least 1 month during 1976, 1978 and 1979. Figures 4-4 and 4-5 show in more detail the period when the total discharge from both wells was a minimum. For example, in September and October 1967, the total discharge for both wells was 80 gpm and 65 gpm, respectively. The most critical low discharge periods are shown on Figure 4-6. During the period from November 1976 to January 1977, the total discharge from both wells was zero.

TASK 2 - GEOLOGICAL AND HYDROLOGICAL RECONNAISSANCE

A literature search was conducted to assess the geology and groundwater hydrology of the area. Communication was established with geologists at the U.S. Geological Survey (USGS), Columbus, Ohio office and Ohio Department of Natural Resources (ODNR), Columbus, Ohio. Contact with universities gave us access to some unpublished master's theses concerning the Lockport Dolomite. Groundwater and geologic maps were obtained from the Ohio Geological Survey and the USGS. Driller well logs from area wells were obtained from ODNR. A cooperative study by the USGS and ODNR provided well logs and pump test data of the carbonate aquifers of northwest Ohio.

TASK 3 - FIELD SURVEYS

The field surveys included the examination of quarry walls for fracture and joint patterns, bedding planes, and solution activity. Excavated areas were observed relative to overburden depth, soil and rock characteristics. Water levels were measured in the on-site wells B-1 and B-2 during periods of discharge and recovery.

Based upon the site history information, reconnaissance and surveys, preliminary sites for the soil test borings and monitor wells were selected.

TASK 4 - SOIL SAMPLING PROGRAM

On October 9 through 11, 1984, test borings were installed at eight on-site locations near areas where VOC was suspected or known to be used (Figure 4-7). The test borings were installed with a rotary drilling rig using hollow-stem augers to advance the hole. A split spoon sampler was used to obtain soil samples at selected depths. A geologist from T A Gleason Associates was present during drilling and sampling.

Each test boring was advanced to the top of the dolomite bedrock. In addition, test boring TB-1 was cored to a depth of 44 feet with a 1-7/8 inch diameter diamond bit. TB-1 was completed as an observation well by installing a 4-inch diameter casing into the rock and sealing the annulus above the rock surface with a cement-bentonite grout.

Test borings TB-3 and TB-7A were completed with a PVC screen placed at the bedrock interface for the purpose of intercepting and sampling seepage at the bedrock interface. The other test borings were completed with a 4-inch diameter PVC casing to the bedrock interface. This completion will facilitate future coring of the bedrock at each location, if such coring is deemed appropriate to the investigations.

Test boring logs and completion logs for the test borings are presented in Appendix A.

The depth to bedrock and type of soil overlying the bedrock is summarized in Table 4-2.

Based on observations, the only evidence of contaminants in the test boring samples was in TB-5, where a thin layer of sand fill sampled just above the bedrock had an oily feel and hydrocarbon odor. Because of the limited extent of the sand layer, this potential contamination was not considered to be significant.

TASK 5 - MONITOR WELL CONSTRUCTION AND DEVELOPMENT

Monitor wells were installed at 11 on-site locations (Figure 4-8). Monitor well installations began on October 18, 1984. At each location, except for location 9, at least two open completion wells were constructed. Wells are designated by location number and depth, i.e. well 4-308 was constructed to a total depth of 308 feet at location 4. The completed depth, i.e. the depth open to the dolomite formation, is the total depth less the length of the surface casing which ranged from 5 to 20 feet. See Appendix A for well completion logs.

The contract drilling company was Sever Drilling Company of Delphos, Ohio. The drill rig used was an Ingersol Rand Company Cyclone drill, model TH-60 equipped with a Denver 250 psi air compressor. The hole was advanced through the soil and upper 3 feet of bedrock with a 12-inch tri-cone bit. Eight-inch ID Schedule 40 PVC pipe with a rubber shoe at its base was set into the hole as a surface casing. A mixture of two parts cement to one part bentonite was poured into the annulus to seal the hole. In order to protect the casing, an 8-inch tri-cone bit was used to advance the hole an additional 2 to 3 feet. The hole was then constructed to total depth with a 6-1/2-inch-diameter air percussion rotary hammer. After total depth was reached, each well was developed with compressed air from the drill rig until the water was clear and no rock chips were present.

A geologist from T A Gleason Associates was present to observe drilling operations, collect and log well cuttings and measure water discharge during well construction and development.

Samples of cuttings were taken at 10-foot intervals in the deepest well at each location. Water discharge was measured at approximately 10-to 20-foot depth intervals utilizing a cut-throat flume. To control the water produced during drilling, sump pits and runoff trenches were dug with a backhoe prior to drilling. Dikes around the well site directed the flow of water to the sump pit, where cuttings settled out. The water then flowed through the runoff trench, where it was measured with a flume. The flume was designed such that the water flowed through a 4-inch throat. The measured height of water in the throat was used to calculate the flow of water. Well Discharge-Depth Records for each well are shown in Figures 2-4 and 2-5.

Monitor wells at locations 1 through 7 were constructed in October 1984. Monitor wells at locations 8 through 11 and an additional well, 2-50, were constructed in February 1985 to further delineate the contaminate plume and to evaluate potential off-site sources to the southeast of Autolite facilities.

Well Completion

All of the wells except for wells 8-150 and 9-307 are open completion in the dolomite. As shown on the well completion logs in Appendix A, wells 8-150 and 9-307 were completed by installing PVC screen at selected depths, gravel packing the annulus and sealing above the gravel pack with a cement-bentonite grout. These two wells were completed at selected depths to assess the vertical gradient in the aquifer and to assess the variance in water quality with depth.

TASK 6 - HYDRAULIC TESTING

After the wells were completed and developed, the reference elevation was surveyed and water levels were measured in each well during the discharge and recovery of the on-site supply wells B-1 and B-2. Drawdown and recovery tests were performed in selected wells to assess hydraulic properties relative to well location, depth and developed zone. Water level measurement data and drawdown data are presented in Appendix A.

TASKS 7 - ON-SITE WATER QUALITY SAMPLING AND ANALYSES

Sampling Procedures and Episodes

The water quality program included the sampling of the two active water supply wells, B-1 and B-2, the new supply well B-3 and sampling the completed monitor wells.

Water Supply Wells

Table 4-3 summarizes the sampling episode for the on-site water supply wells. Active wells B-1 and B-2 were sampled from taps near the well head and new well B-3 was sampled from the discharge line during the pump test. Except for the May sampling, only VOC samples were obtained during each sampling. A VOC sample consisted of filling three 40 ml borosilicate glass vials (with a Teflon septum) and sealing with a screw cap. The bottle was inverted after sealing to check for air bubbles. If bubbles were present, the sample was discarded. The sample vials were stored in an ice-packed cooler to maintain the temperature at approximately 4°C during transportation to the laboratory. The samples remained in the custody of T A Gleason Associates until they were delivered to Howard Labs, Inc., Dayton, Ohio, with a completed custody record, which was signed by a representative of Howard Labs.

Monitor Wells

All sampled monitor wells and TB-1 were sampled for VOC only. All sampling was performed by representatives of T A Gleason Associates.

Initial Sampling Methods: October 30 to November, 1984

All completed monitor wells were sampled with a PVC bailer after removing the equivalent of 10 well volumes with a centrifugal pump and 1-inch suction hose placed to a depth of approximately 25 feet. Although this sampling procedure provided an indication of the water quality, it did not, in our opinion, provide representative samples of the aquifer at each location. To improve the sampling procedure, we installed dedicated sampling tubes with screens and/or open ends at various depths in the wells to obtain groundwater samples. Well sampling diagrams, presented in Appendix A, show the depth of the screens and/or open tubes placed in each monitor well.

For example, well 1-322 has sampling tubes screened at an average depth of 208 feet and 315 feet; well 1-125 has a sampling tube screened at a depth of 40 feet.

For definition purposes, the monitor well sample is designated by the well location, well depth, and average depth of opening. For example, a sample from monitor well 1-322 obtained from the tube screened from 205 to 210 feet is designated sample 1-322 (208). Although the use of the sampling tubes and screens does not assure that the sample is representative of the groundwater quality at the sampling depth, it is, in our opinion, a cost effective and appropriate method to sample groundwater at variable depths from open completion wells.

Subsequent Sampling Methods and Episodes

Prior to obtaining a sample with a dedicated PVC bailer, the well was "purged" by removing approximately 10 well volumes with a centrifugal pump attached to the top of the dedicated sampling tube. After purging, a "sample" was obtained by filling the 40 ml glass vials from a bailer dedicated to the sampling tube being sampled. Sample handling, storage and transportation procedures were presented in a previous section. Table 4-4 presents a summary of the monitor well sampling episodes.

Analytical Methods and Results

Since October, 1984, all of the on-site groundwater samples were analyzed by Howard Labs, Inc., Dayton, Ohio. Previous samples of B-1 and B-2 groundwater were analyzed by contract labs and Autolite laboratories. Howard Labs used analytical method USEPA Method 1624 - Volatile Organic Compounds by Isotope Dilution GC/MS.

Water Supply Wells

Analytical results for water supply wells B-1, B-2, and B-3 are presented in Table 4-5. Table 4-5 shows that well B-1 has sampled groundwater with maximum TCE and total VOC concentrations of approximately 20,500 ppb and 21,000 ppb, respectively. Well B-2 has sampled groundwater with maximum TCE and total VOC concentration of approximately 800 ppb and 900 ppb, respectively. Results from B-3 during the pump test show maximum levels of TCE and total VOC concentrations of approximately 10,000 and 10,100, respectively.

Monitor Wells

Analytical results for monitor wells are presented in Table 4-6. The highest TCE and total VOC concentrations were sampled in well 10-203 (196), 20,500 ppb and 21,428 ppb, respectively.

Wells 8-150 (100) and 9-307 sampled total VOC in excess of 2,500 ppb. None of the monitor wells at locations other than 8, 9 and 10 sampled total VOC in excess of 250 ppb.

TASK 8 - PUMP TEST

The aquifer pump test was originally scheduled to commence in November 1984, but was postponed due to malfunction of our transducer water level recording equipment. Further postponement resulted from the initiation of off-site investigations in December 1984. The postponement provided the opportunity for additional assessment of the aquifer, and resulted in the decision to install a new well near B-1, i.e., B-3, which was used for the pump test and can replace B-1 as a process water supply well.

The 8-inch B-3 well was constructed to a depth of 318 feet on April 8-9, 1985. A total of 34.5 feet of 8-inch steel surface casing was cemented in place to seal the overburden soils. After well completion, Dunbar Pump Company installed a 25 h.p. submersible pump in the well. The discharge head was connected to a flow meter and pressure gauge. Discharge water was piped to two sewers via irrigation pipe. To facilitate the measurement of water levels, pressure transducers were installed in wells 10-63, 10-200, 5-300, 6-300, 2-300 and B-3. Readings from these transducers were transmitted via cable to a central control panel where the readings were printed on paper tape.

A potential complicating factor in the analysis of the pump test data was the pumping activity of the B-1 and B-2 wells. B-1 was discharging approximately 100 gpm until it was shut off 10 days prior to the commencement of the pump test. B-2 was discharging 180 to 200 gpm on weekdays and 60 to 70 gpm on weekends prior to and during the pump test.

The pump test commenced at 1335 on April 13, 1985, and continued for 92 hours. The discharge rate was checked and adjusted four times daily to maintain a constant rate of approximately 336 gpm. At the end of the 92-hour test, the pump was shut off and water level recovery was measured for an additional 23 hours.

Time-drawdown graphs for the on-site wells were plotted on semi-logarithmic paper, with time on the logarithmic horizontal scale and drawdown on the vertical scale (Figure 4-9). Transmissivities (T) and storage coefficients (S) were calculated using Jacob's modified nonequilibrium formula:

$$T = \frac{264\ Q}{s}$$ transmissivity, gpd/ft

where:

Q = pump rate, gpm
s = drawdown per log cycle

and $$S = \frac{.3Tt_o}{r^2}$$ = storage coefficient

where: t_o = intercept of straight line at 0 drawdown, in days

r = distance, in feet, from pumped well to observation well

Values for T and S from time-drawdown calculations are presented in Table 4-7. The time-drawdown graphs are presented in Appendix B. Data from the time-drawdown graphs were used to construct distance-drawdown graphs; i.e., drawdowns at the various observation wells at a particular time are plotted on the vertical scale, and the distance of each monitor well from the pumped well is plotted on the logarithmic horizontal scale. Distance drawdown plots were made for 1,000, 2,000, 3,000 and 5,000 minutes after pumping started (Figure 4-10).

Transmissivity and storage coefficient were calculated from each graph using Jacob's formulae:

$$T = \frac{528Q}{s}$$ Transmissivity, gpd/ft

where:

Q = pumping rate, gpm
s = drawdown per log cycle

$$S = \frac{.3Tt}{r_o^2}$$ Storage coefficient

where: t = time since pumping started, in days

r_o = intercept at 0 drawdown of extended straight line, in feet

Values for T and S from distance-drawdown calculations are presented in Table 4-8. The distance-drawdown graphs are presented in Appendix B.

As previously mentioned, the pumping of well B-2 was a potential complicating factor in the analysis of the pump test. The effects of B-2 were twofold. First, because the pump test commenced on a weekend, B-2's pumping rate was 60 gpm rather than its average weekday rate of approximately 200 gpm. Therefore, the aquifer near B-2 was partially recovered when the pump test commenced. This recovery was observed in the monitor wells at sites 1, 8 and 9, and for this reason, we did not utilize these wells for analyses. Second, well B-2 resumed its average weekday pump rate at approximately midnight on April 14, about 2,000 minutes into the pump test. The effect of this pumping rate was assessed in evaluating the effects of pumping B-3. We concluded that the affects of B-2 were relatively insignificant.

TASK 9 - OFFSITE WATER QUALITY SAMPLING AND ANALYSES

Initial Sampling by Autolite

Five private residential wells and one commercial well were sampled on 5/23/84. The results are presented in Table 4-9A and were discussed in previous sections of this report.

Drawing 4 and Figure 4-11 show the location and identification numbers for all off-site sampling locations which are referred to in subsequent sections.

November 13, 1984 Sampling

T A Gleason Associates first sampled offsite private residential wells on November 13, 1984; six private wells were sampled. Samples from these six wells were also obtained by the Seneca County Health Department (SCHD). Analytical results from Howard Labs, Inc., showed the presence of total VOC, ranging from 5 to 52 ppb in four of the wells and zero VOC in two of the wells. The highest reported VOC concentration, 52 ppb, was sampled in the James Harris Well located at 1712 Walnut Street. SCHD's contract lab, Aqua Tech, reported the presence of Total VOC ranging from 1 to 20 ppb in five of the wells and zero VOC in one of the wells. Analytical results are presented in Table 4-9 and Figure 4-12.

December 10-19, 1984 Sampling

Based upon the analyses of the flow direction and analytical results from the private wells, Autolite initiated an off-site well inventory and sampling program within an area defined by a 5,000-foot radius from the Autolite facility. Beginning on December 10, 1984, 31 off-site residential wells and 8 commercial/industrial wells identified in Table 4-10 were sampled. Locations are shown on Drawing 4 and Figure 4-13.

Table 4-11 shows the presence of trihalomethanes (chloroform, bromodichloromethane, and dibromochloromethane) in residential wells R-97 and R-99, located south of Autolite facilities (Drawing 4). Subsequent investigations showed that these wells were cross-connected to city water, which is believed to be the source of the trihalomethanes. Table 4-11 shows that the Fostoria Industries' well sampled total VOC in excess of 20,500 ppb and the Roppe Rubber well sampled total VOC in excess of 850 ppb.

January 4, 1985 Sampling

Eight residential wells, the Chrysler Foundry well, the quarry, and the drainage ditch north of Jones Road were sampled on January 4, 1985 (Table 4-12).

Howard Labs results for the six residential wells detecting VOC are presented in Table 4-13.

Total VOC sampled at depths from surface to 22 feet in the quarry range from 0 to 22 ppb. Sample C14 from the drainage ditch nearest to Jones Road sampled 17 ppb total VOC, while the other two ditch samples did not detect VOC.

January 10-12, 1985 Sampling

On January 10-12, 63 residential wells and the Dollar General Store Well were sampled. Table 4-14 presents the locations sampled and Table 4-15 presents analytical results from Howard Labs.

Table 4-15 shows that eleven residential wells sampled total VOC ranging from 1 to 26 ppb. Nine of the eleven wells sampled total VOC less than 10 ppb. The Dollar General Store well sampled 162 ppb of tetrachloroethene, a solvent used in the dry cleaning industry.

Summary

Tables 4-16 through 4-18 present the analytical results for all off-site sampling locations where VOC have been detected. The results are presented for Howard Labs and Aqua Tech.

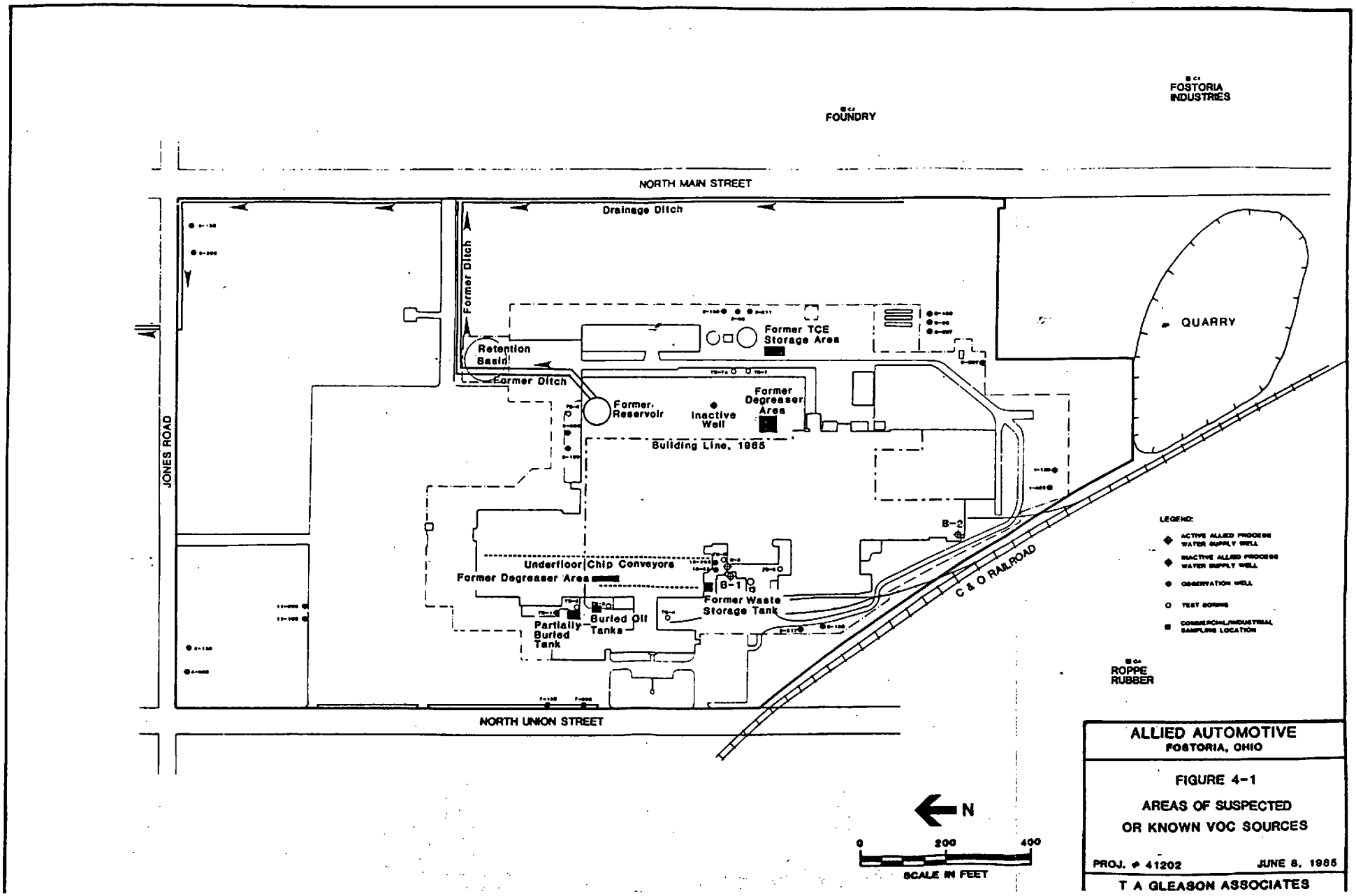
Figure 4-16 presents water quality results from Howard Labs through January 12, 1985 for the northwest area locations.

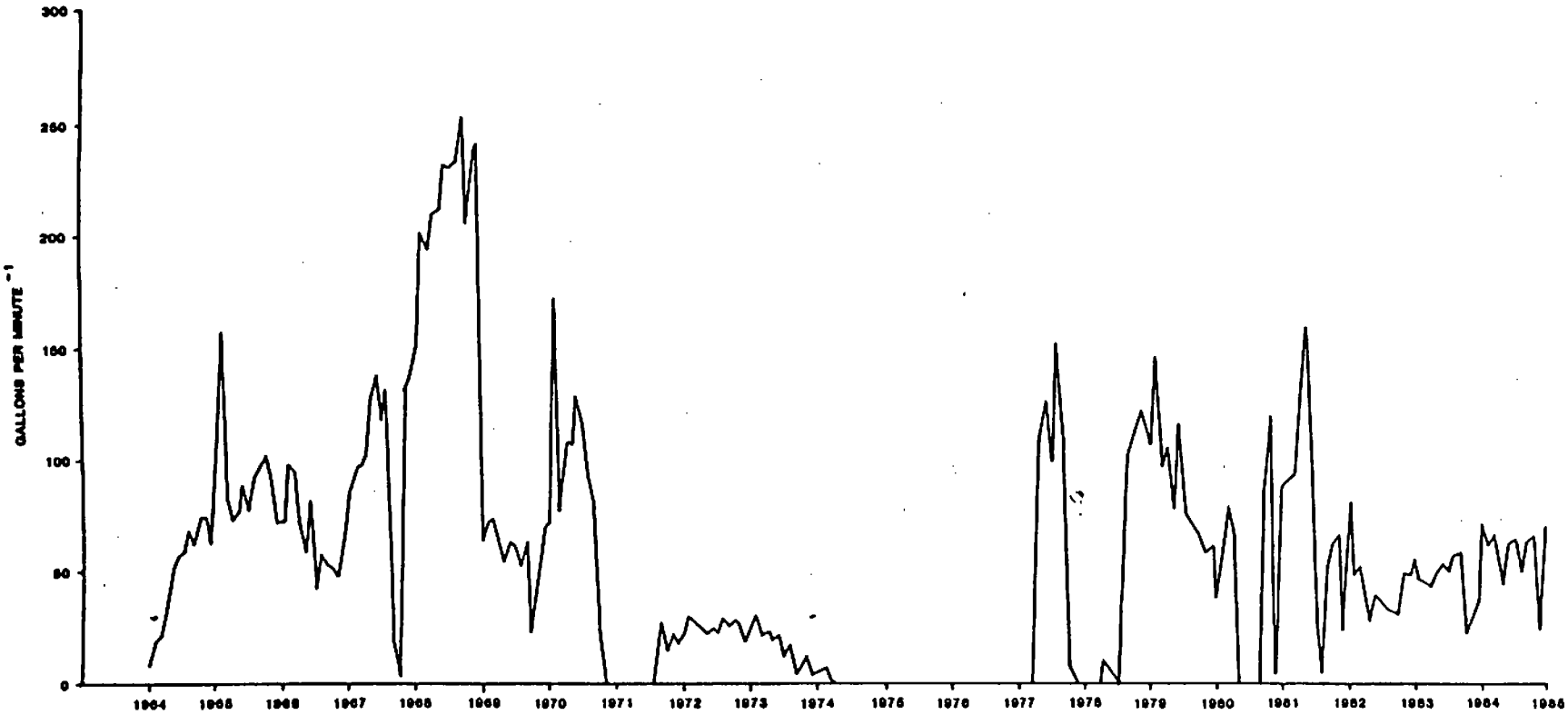
TASK 10 - ASSESSMENT OF GENERAL GROUNDWATER FLOW IN THE FOSTORIA AREA

Water levels were measured in 29 residential wells, 13 commercial/industrial wells and two quarries in December 1984 and January 1985 to assess depth and direction of flow in the Lockport aquifer.

Table 4-19 to 4-21 presents the well ID number, owner, location and reference elevation for the wells and surface water bodies used in the survey.

Drawings 1 and 2 presents the groundwater flow maps for water levels measured in December and January, respectively. Drawings 1 and 2 show the general direction of flow to be from south to north except where discharging wells produce cones of influence. Figure 2-7 shows the effects of significant discharging from the city wells near the reservoirs and from the Autolite on-site wells.


FOSTORIA INDUSTRIES
FOUNDRY
NORTH MAIN STREET
Drainage Ditch
Former Ditch
Former TCE Storage Area
Retention Basin
Former Ditch
Former Reservoir
Inactive Well
Former Degreaser Area
Building Line, 1985
QUARRY
JONES ROAD
B-2
Underfloor Chip Conveyors
Former Degreaser Area
B-1
Former Waste Storage Tank
Buried Oil Tanks
Partially Buried Tank
C & O RAILROAD
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION
ROPPE RUBBER
NORTH UNION STREET
N
0
200
400
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 4-1
AREAS OF SUSPECTED
OR KNOWN VOC SOURCES
PROJ. # 41202
JUNE 8, 1985
T A GLEASON ASSOCIATES

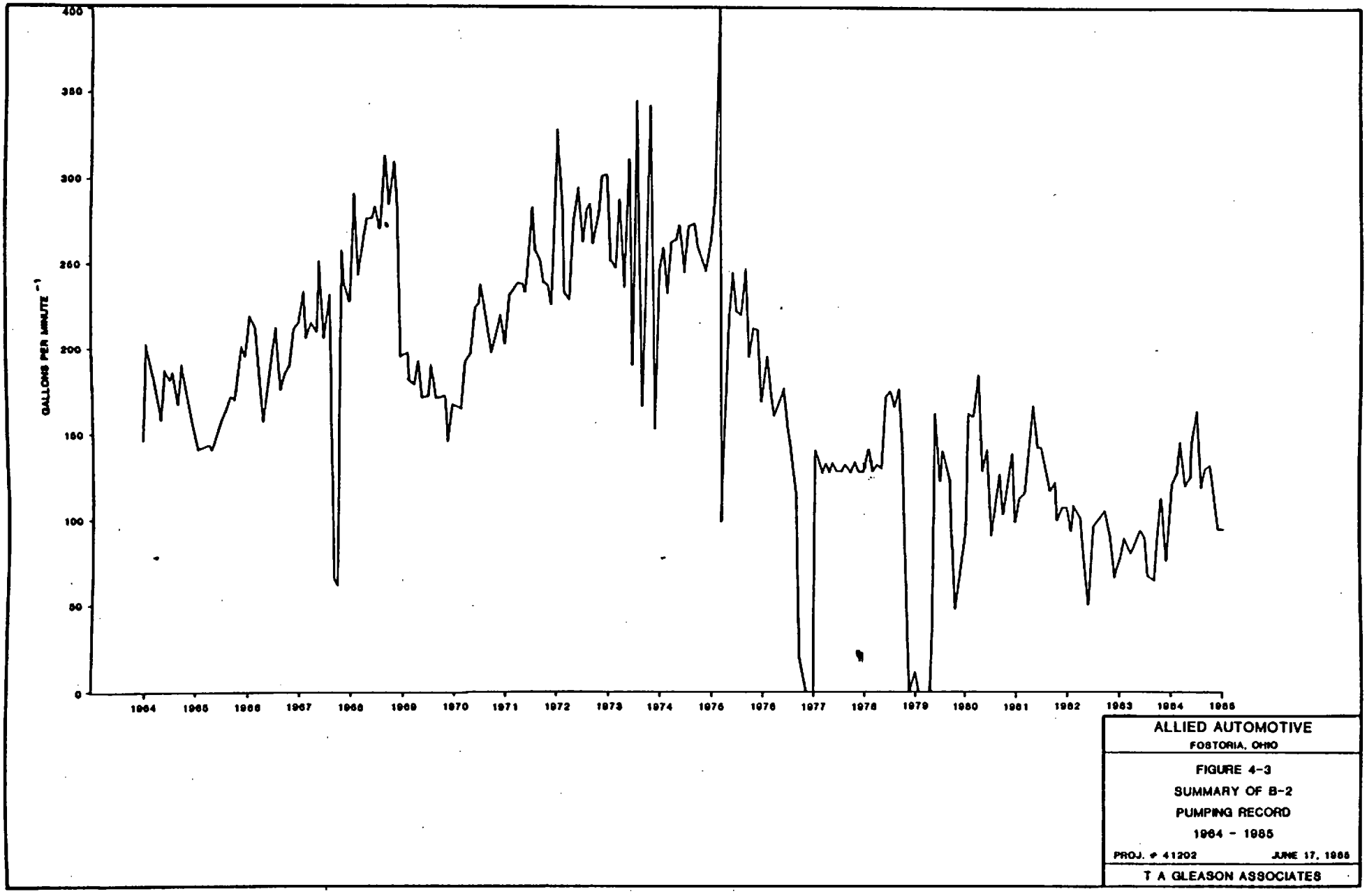


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-2
SUMMARY OF B-1
PUMPING RECORD
1964 - 1985

PROJ. # 41202 JUNE 17, 1986

T A GLEASON ASSOCIATES

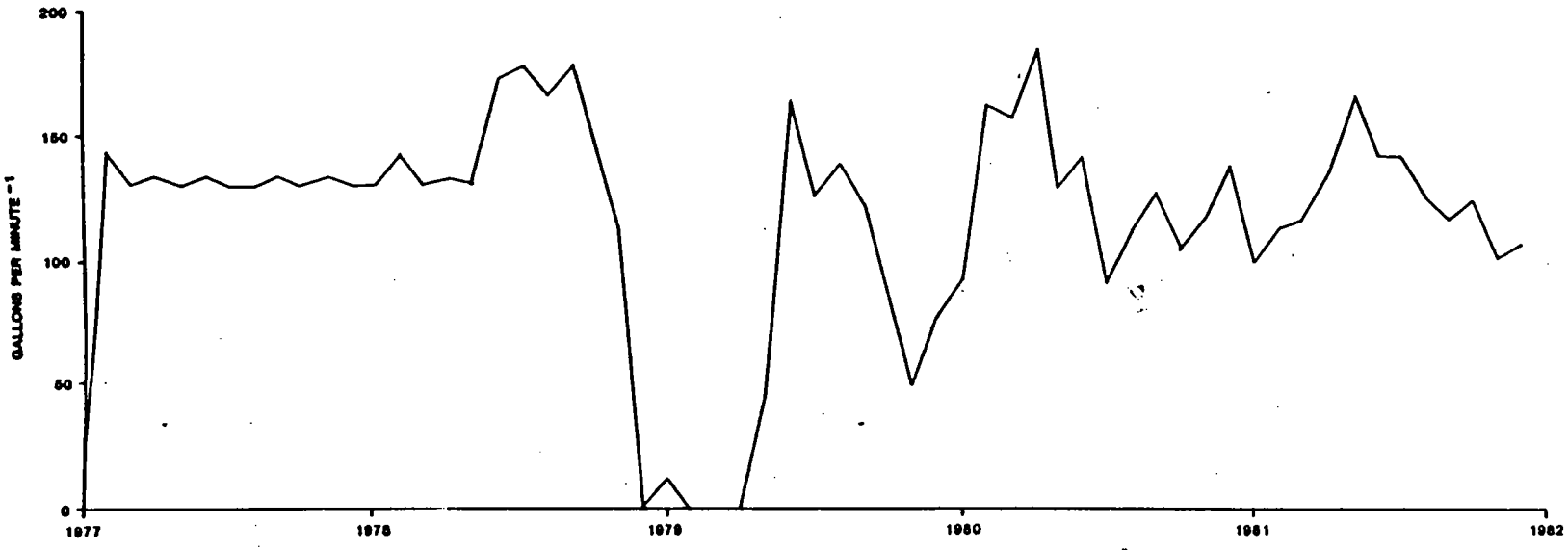


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-3
SUMMARY OF B-2
PUMPING RECORD
1964 - 1985

PROJ. # 41202 JUNE 17, 1985

T A GLEASON ASSOCIATES

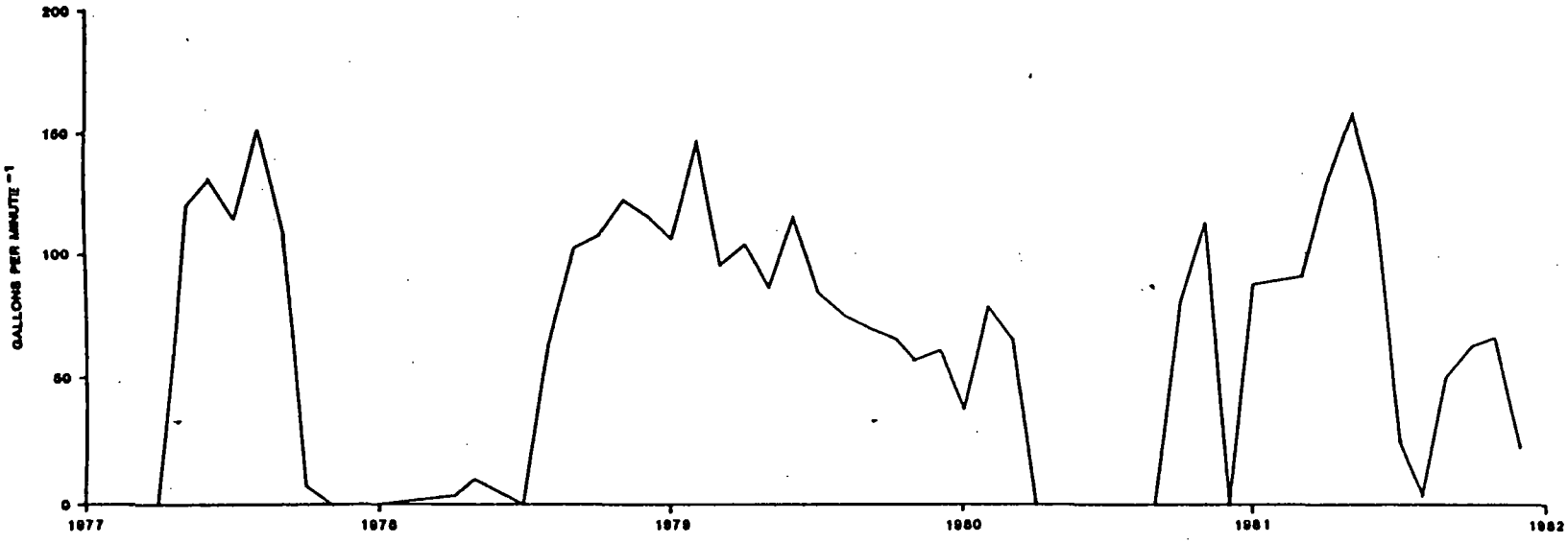


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-4
SUMMARY OF B-1
PUMPING RECORD
1977 - 1982

PROJ. # 41202 JUNE 17, 1986

T A GLEASON ASSOCIATES

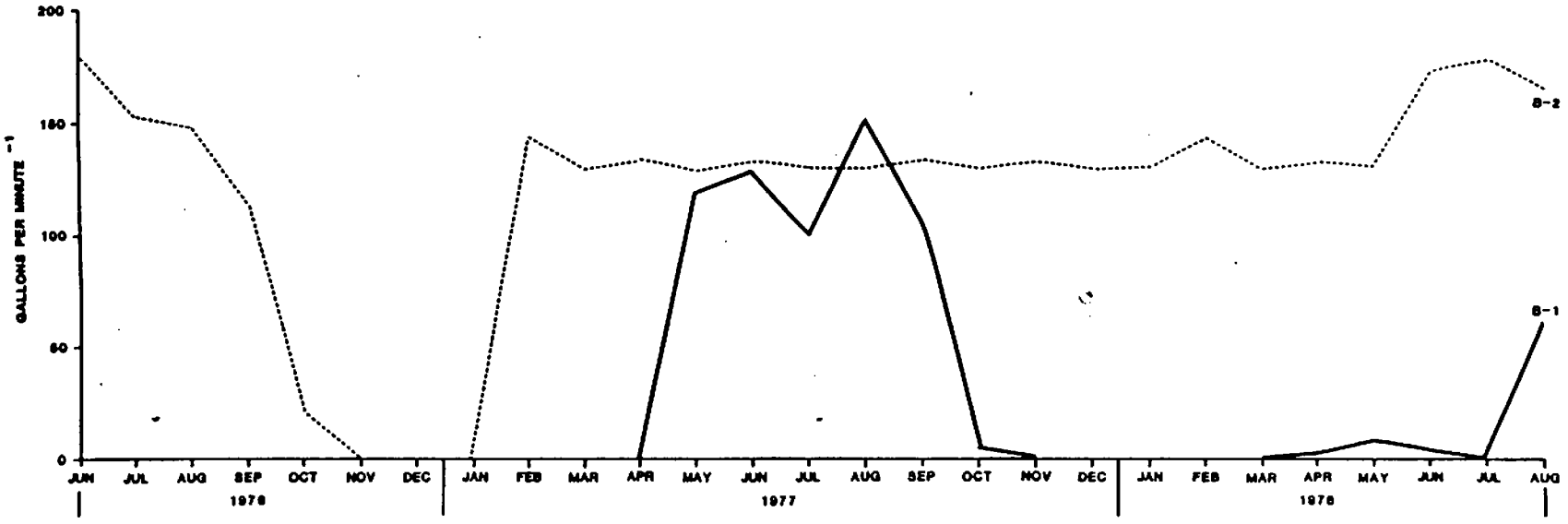


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-5
SUMMARY OF B-2
PUMPING RECORD
1977 - 1982

PROJ. # 41202 JUNE 17, 1988

T A GLEASON ASSOCIATES

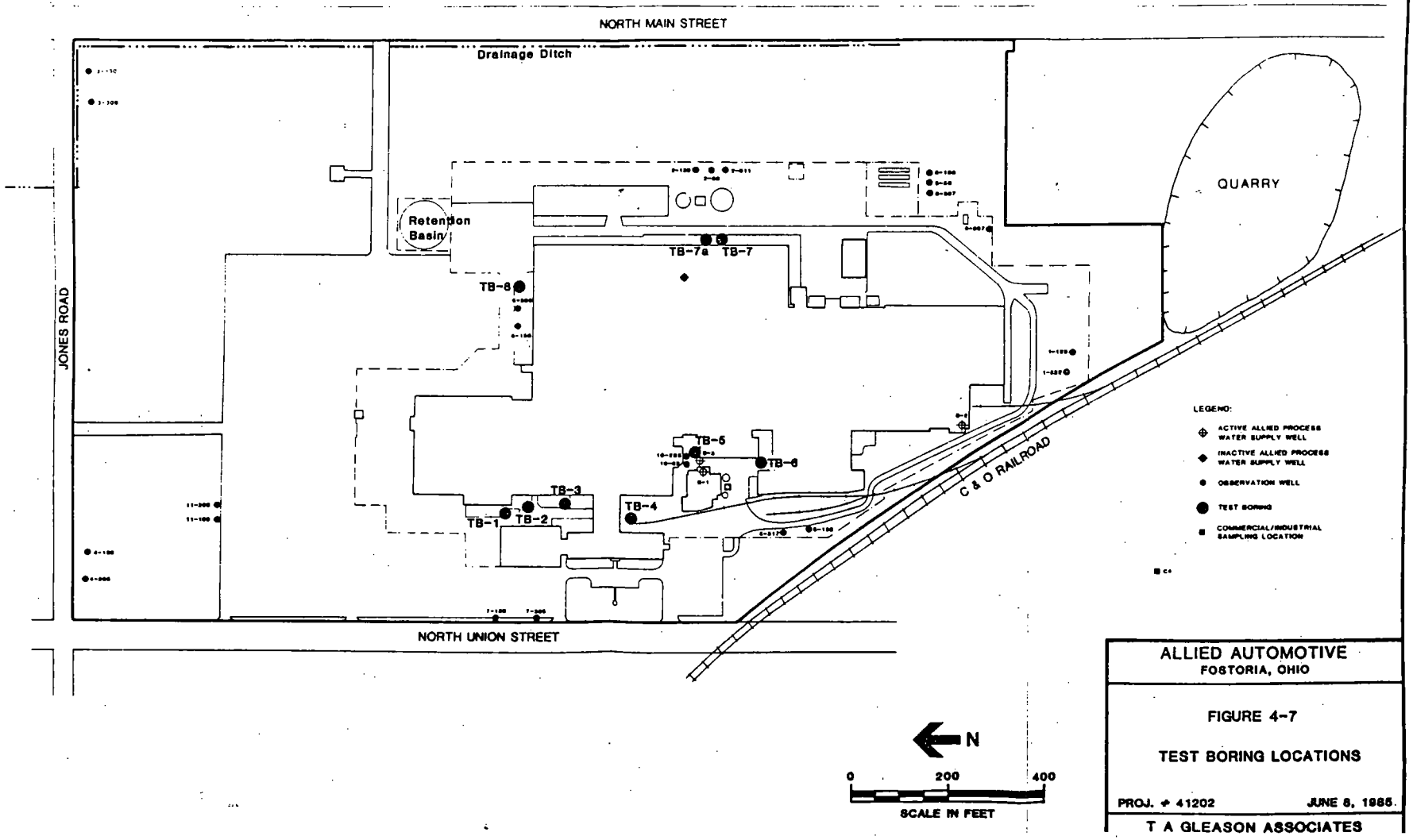


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-6
PERIODS OF LOW DISCHARGE
IN WELLS B-1 AND B-2
1976 - 1978

PROJ. # 41202 JUNE 14, 1988

T A GLEASON ASSOCIATES



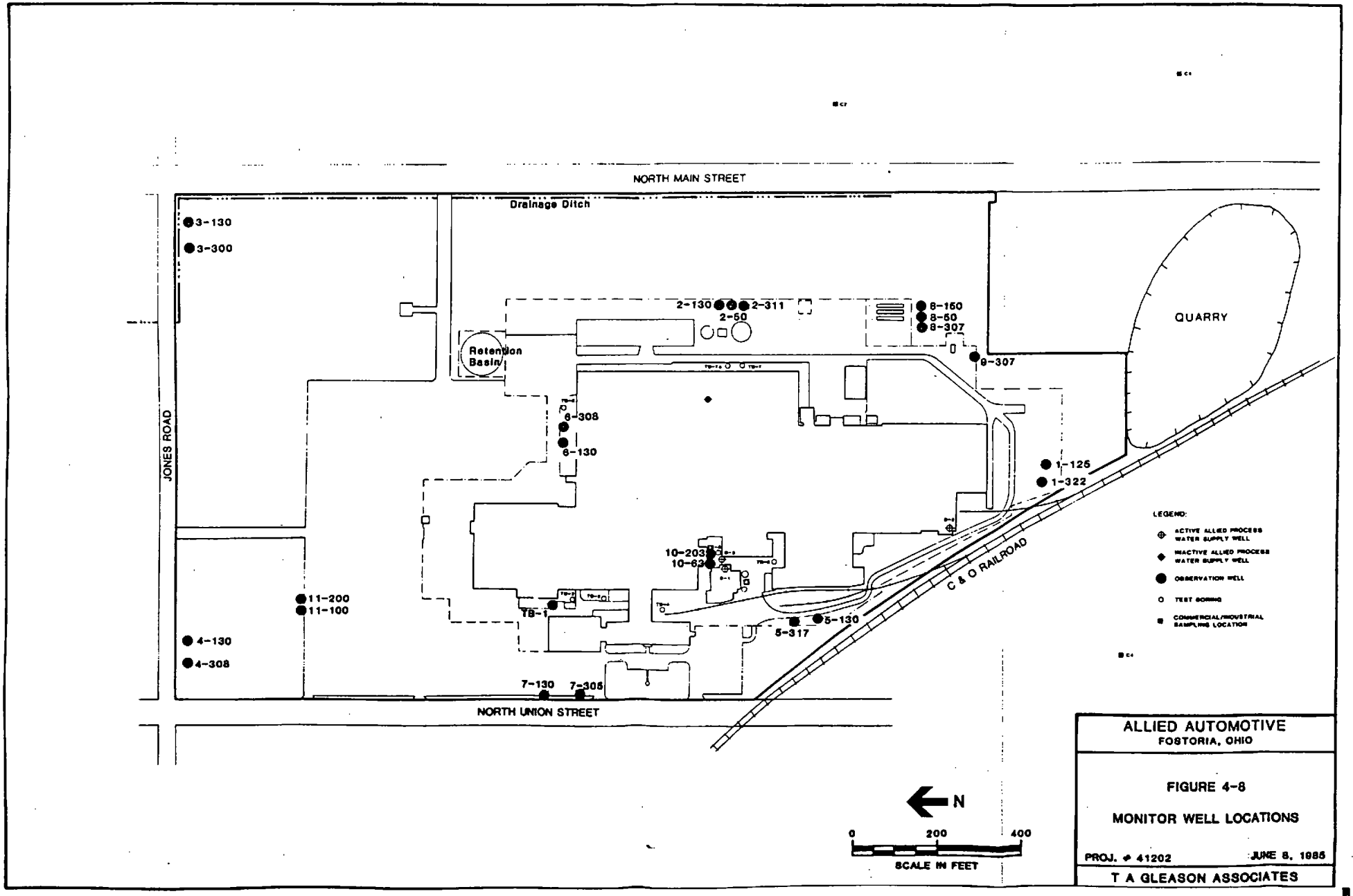
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

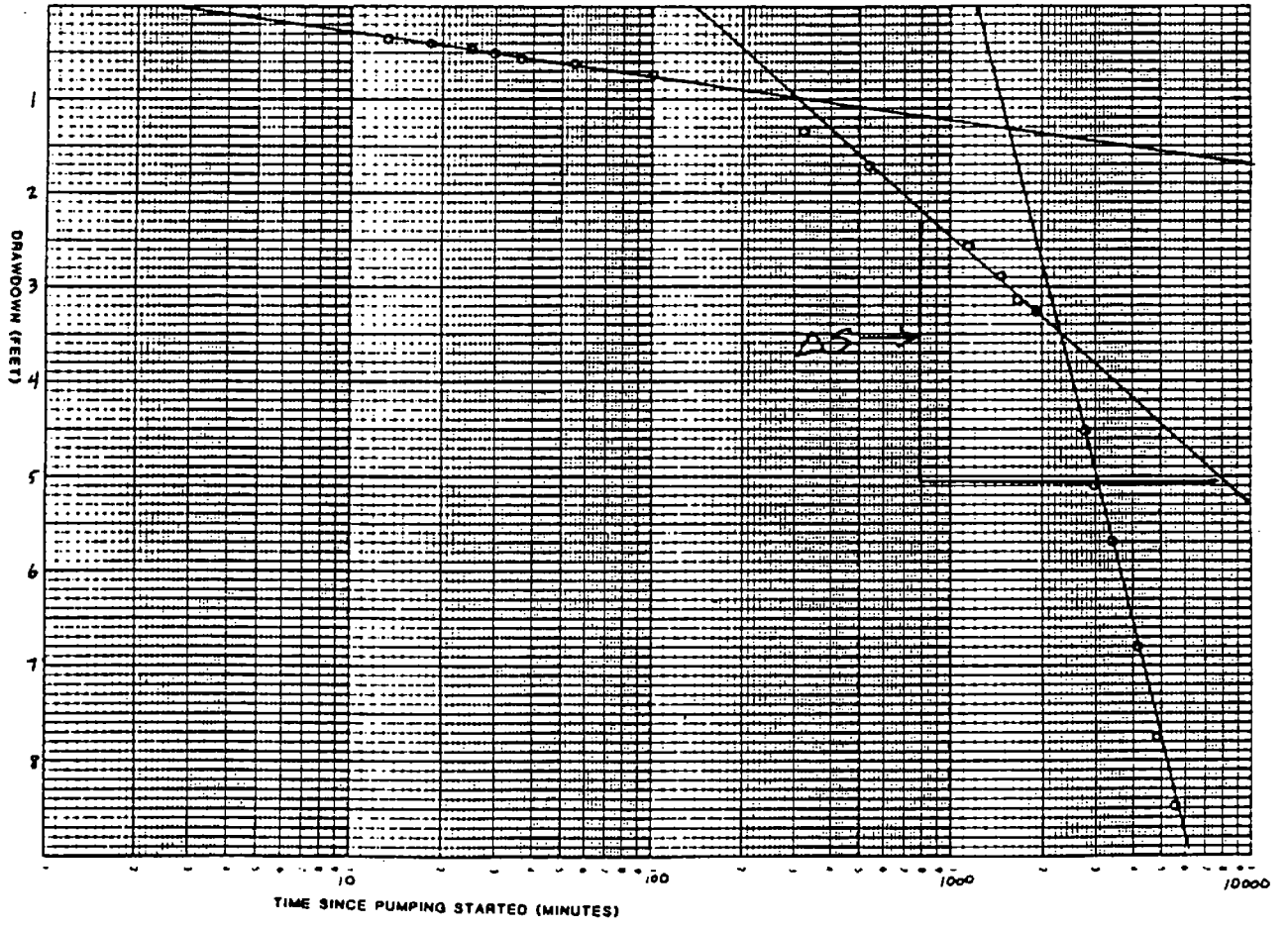
FIGURE 4-7

TEST BORING LOCATIONS

PROJ. # 41202 JUNE 8, 1985

T A GLEASON ASSOCIATES

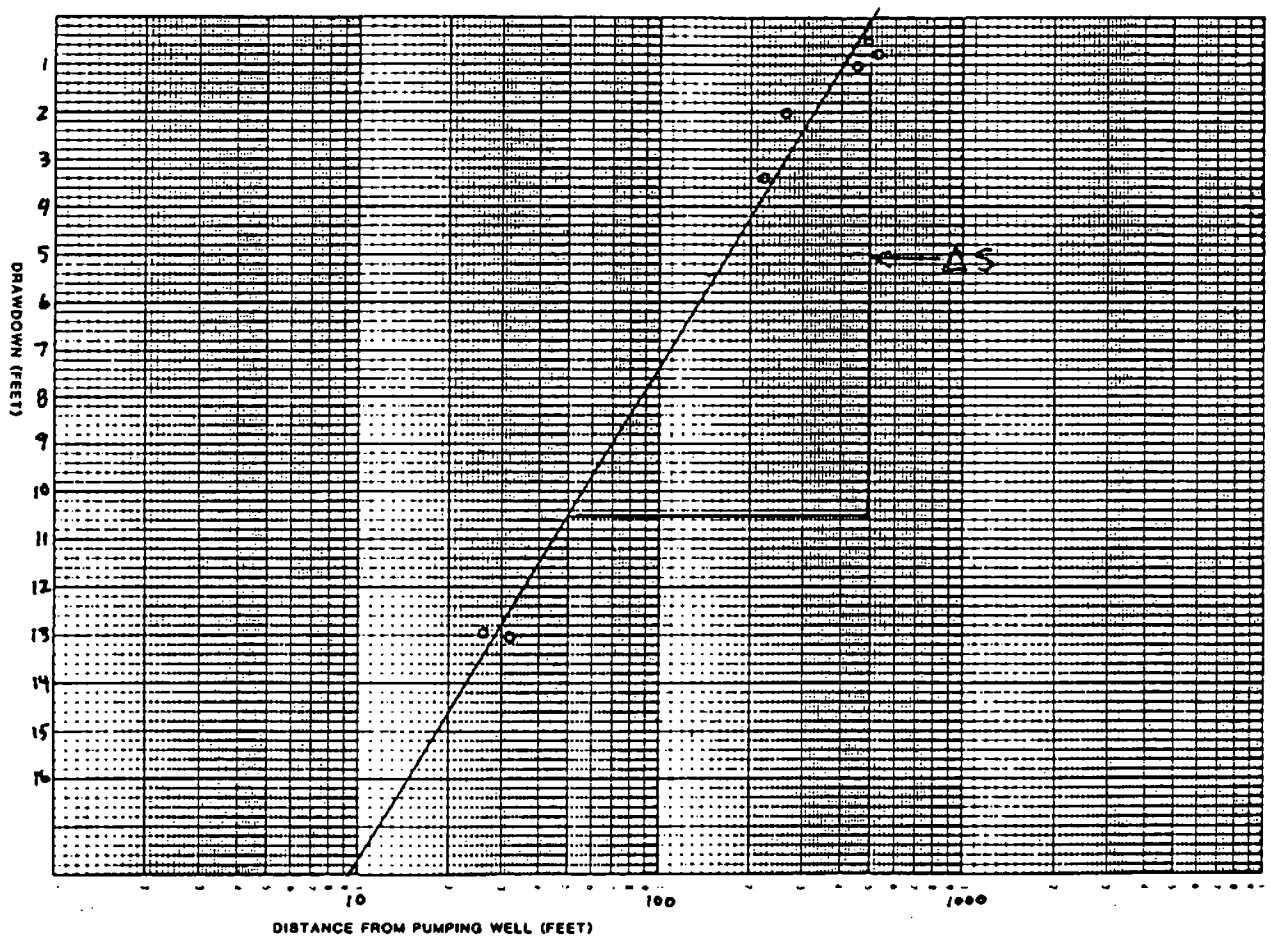

NORTH MAIN STREET
Drainage Ditch
JONES ROAD
NORTH UNION STREET
3-130
3-300
2-130
2-311
2-50
8-150
8-50
8-307
8-307
Retention Basin
8-308
8-130
QUARRY
1-125
1-322
10-203
10-63
TB-1
11-200
11-100
4-130
4-308
5-130
5-317
7-130
7-305
C & O RAILROAD
LEGEND:
ACTIVE ALLIED PROCESS WATER SUPPLY WELL
INACTIVE ALLIED PROCESS WATER SUPPLY WELL
OBSERVATION WELL
TEST BORING
COMMERCIAL/INDUSTRIAL SAMPLING LOCATION
N
0
200
400
SCALE IN FEET
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE 4-8
MONITOR WELL LOCATIONS
PROJ. # 41202
JUNE 8, 1985
T A GLEASON ASSOCIATES



T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TYPICAL TIME DRAWDOWN GRAPH

Figure No.
4-9



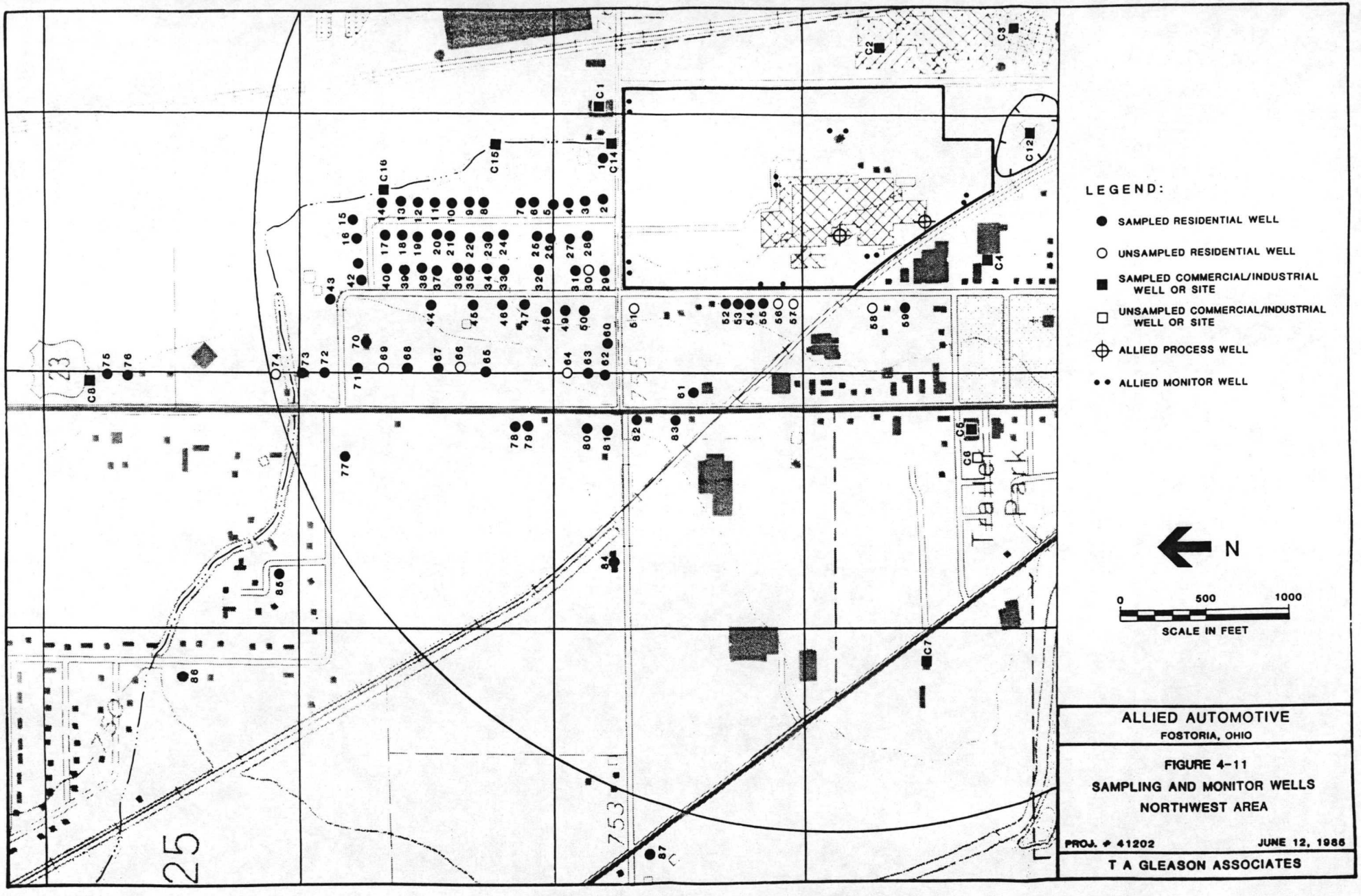
T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

TYPICAL DISTANCE DRAWDOWN GRAPH

Figure No.

4-10

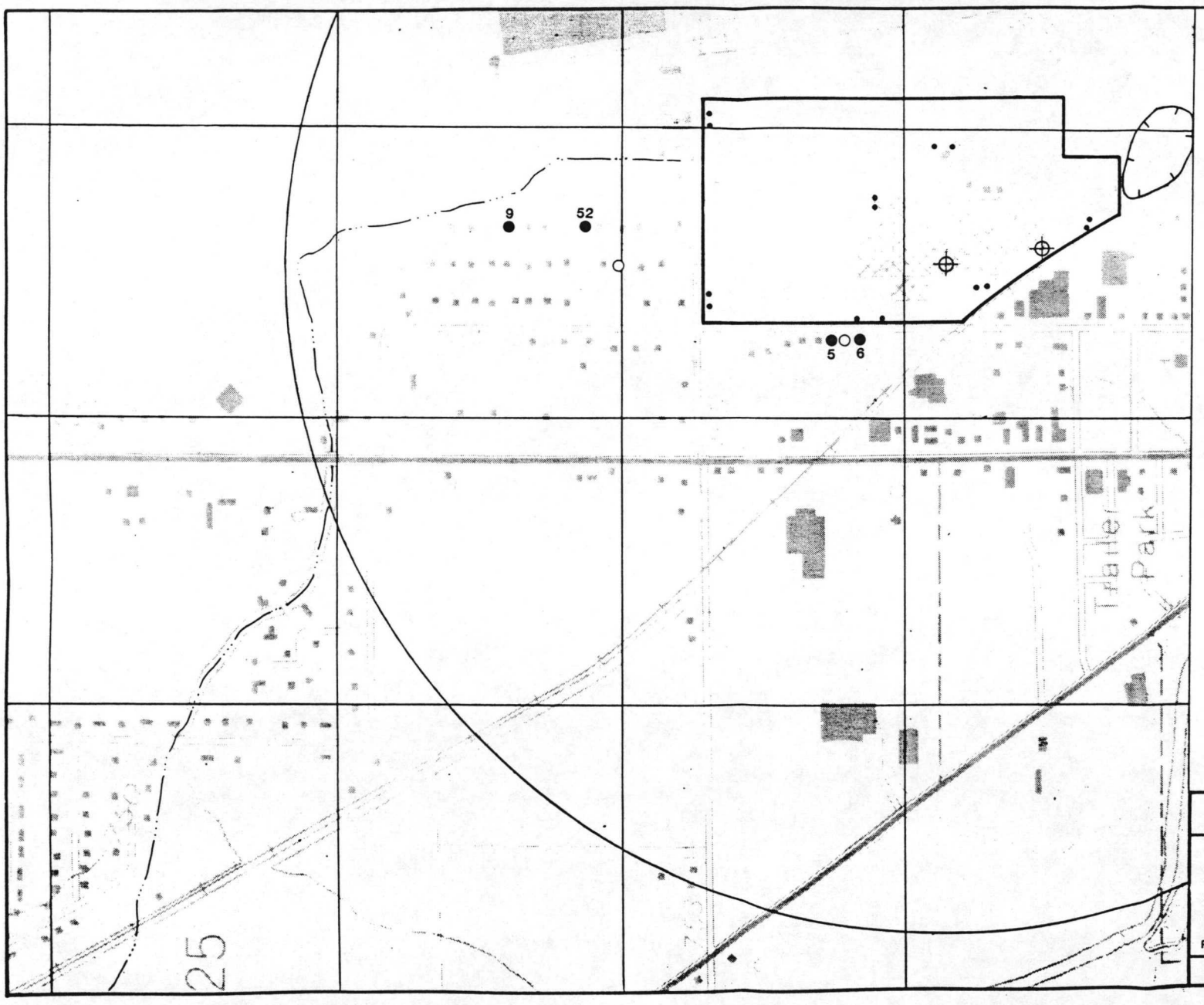


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-11
SAMPLING AND MONITOR WELLS
NORTHWEST AREA

PROJ. # 41202 JUNE 12, 1985

T A GLEASON ASSOCIATES



LEGEND:

Residential Sampling Location:

○ ZERO VOC

● VOC DETECTED

26 TOTAL VOC (ppb)*

* Reported by Howard Labs, Inc.

N

0 500 1000

SCALE IN FEET

ALLIED AUTOMOTIVE

FOSTORIA, OHIO

FIGURE 4-12

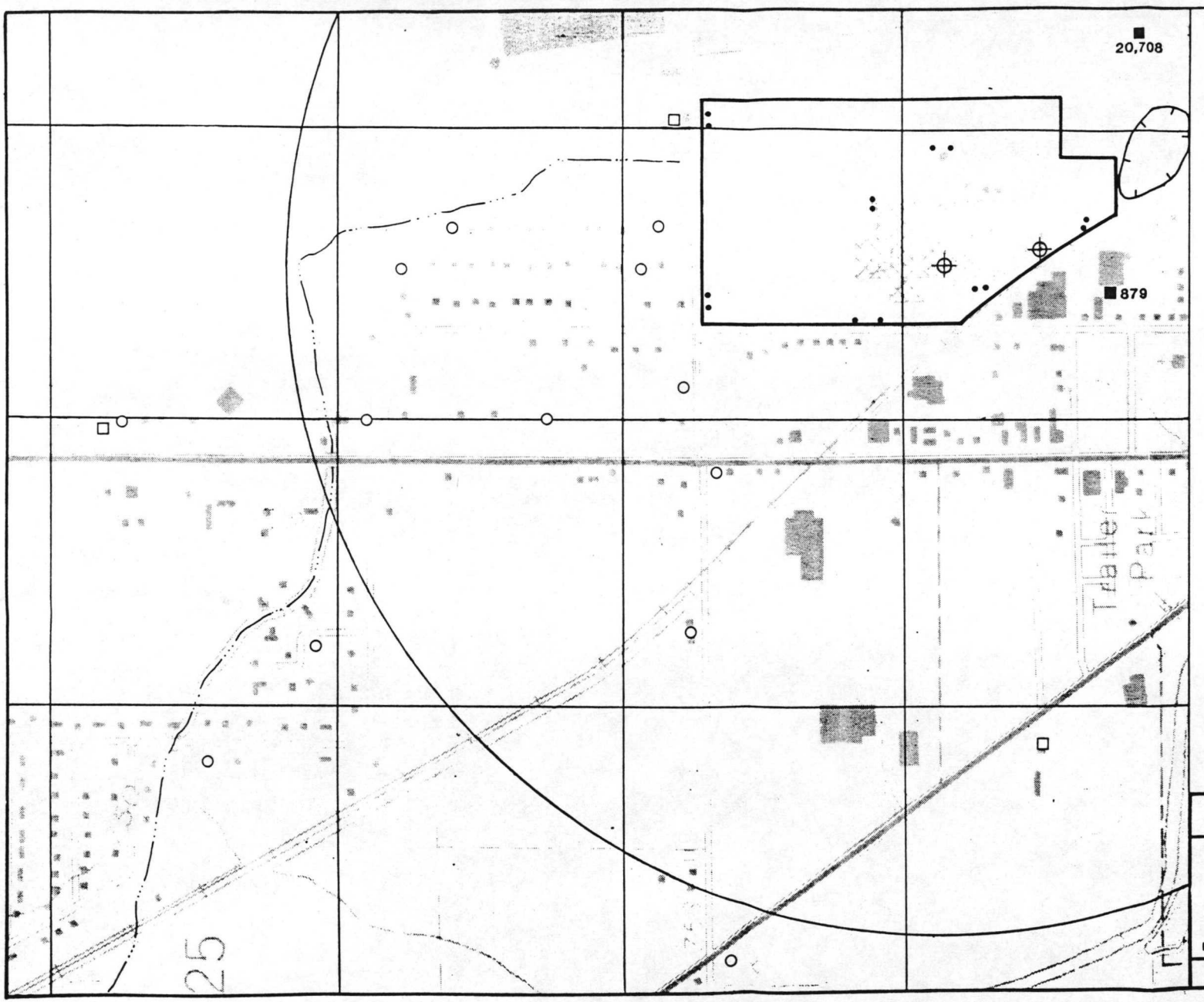
SAMPLING AND MONITOR WELLS

NORTHWEST AREA

SAMPLED 11/13/84

PROJ. # 41202 JUNE 18, 1985

T A GLEASON ASSOCIATES



LEGEND:

Residential Sampling Location:

- ○ ZERO VOC
- ● VOC DETECTED
- 26 TOTAL VOC (ppb)*

Commercial/Industrial Sampling Location:

- □ ZERO VOC
- ■ VOC PRESENT
- 26 TOTAL VOC (ppb)*

* Reported by Howard Labs, Inc.

N

0 500 1000

SCALE IN FEET

ALLIED AUTOMOTIVE

FOSTORIA, OHIO

FIGURE 4-13

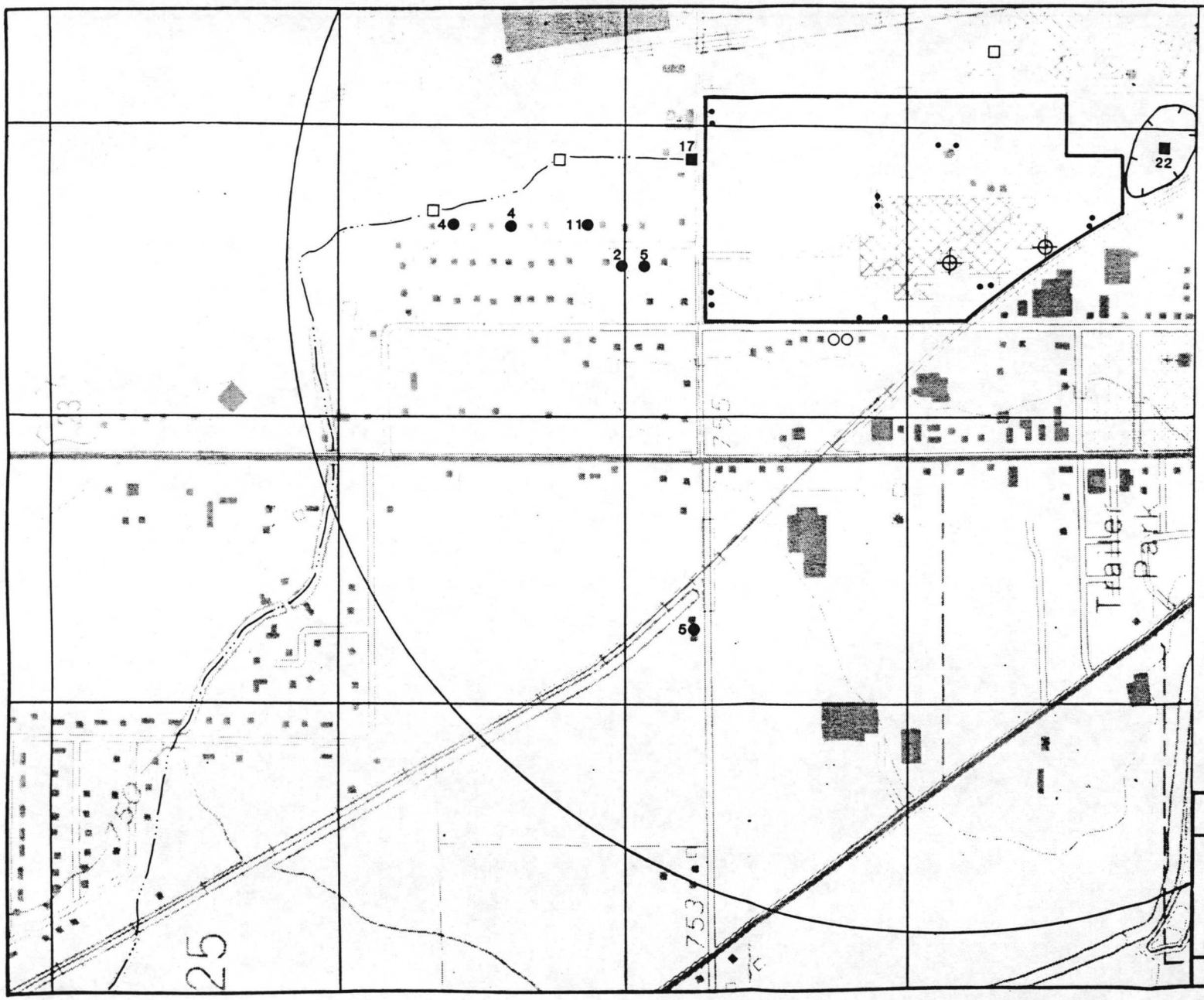
SAMPLING AND MONITOR WELLS

NORTHWEST AREA

SAMPLED 12/10/84-12/19/84

PROJ. # 41202 JUNE 18, 1985

T A GLEASON ASSOCIATES



LEGEND:

Residential Sampling Location:

○ ZERO VOC

● VOC DETECTED

▼ ONLY TETRA DETECTED

26 HIGHEST TOTAL VOC (ppb) *

Commercial/Industrial Sampling Location:

□ ZERO VOC

■ VOC DETECTED

▲ ONLY TETRA DETECTED

26 HIGHEST TOTAL VOC (ppb)*

*Reported by Howard Labs, Inc.

N

0 500 1000

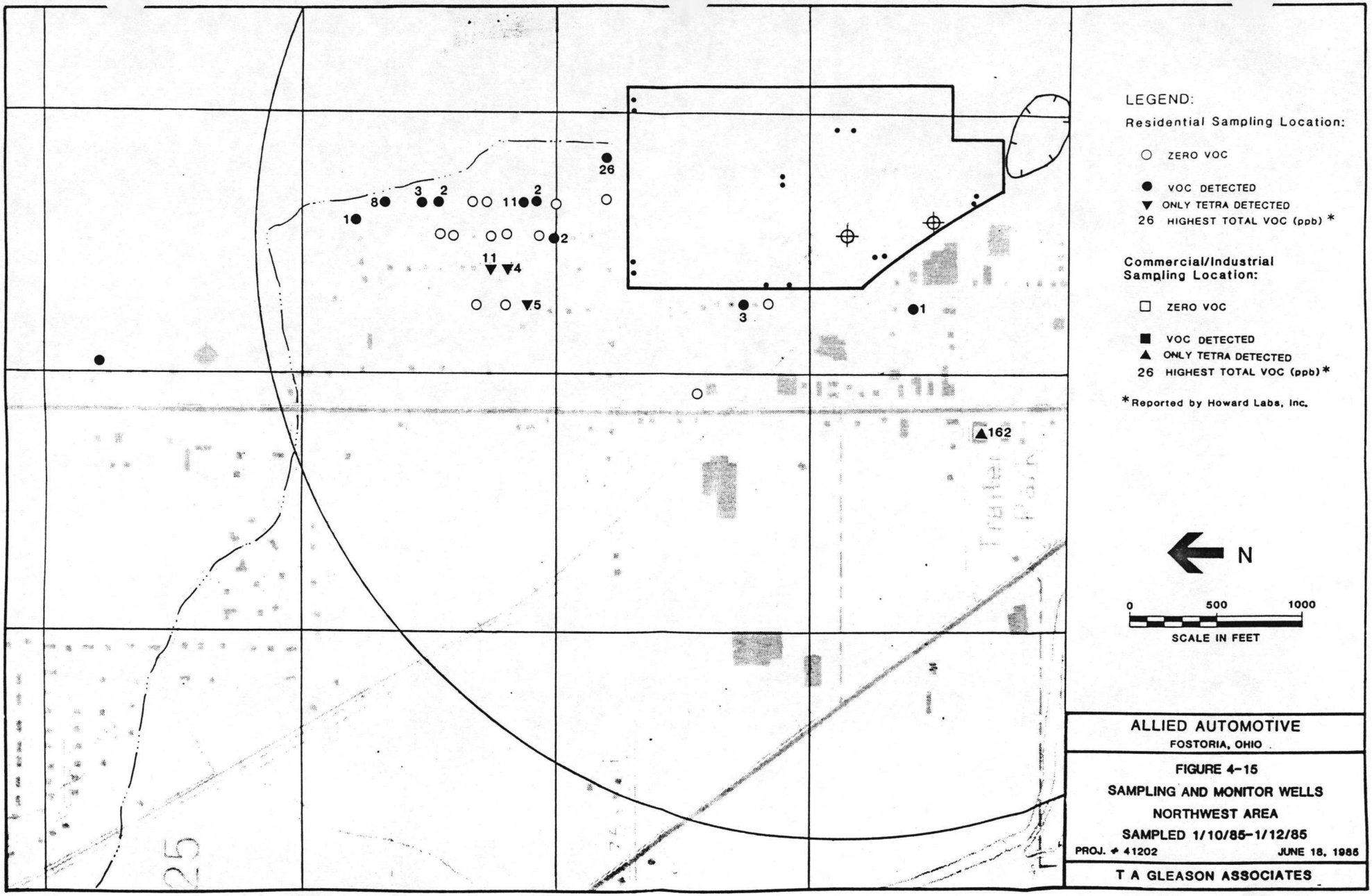
SCALE IN FEET

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-14
SAMPLING AND MONITOR WELLS
NORTHWEST AREA
SAMPLED 1/4/85

PROJ. # 41202 JUNE 18, 1985

T A GLEASON ASSOCIATES

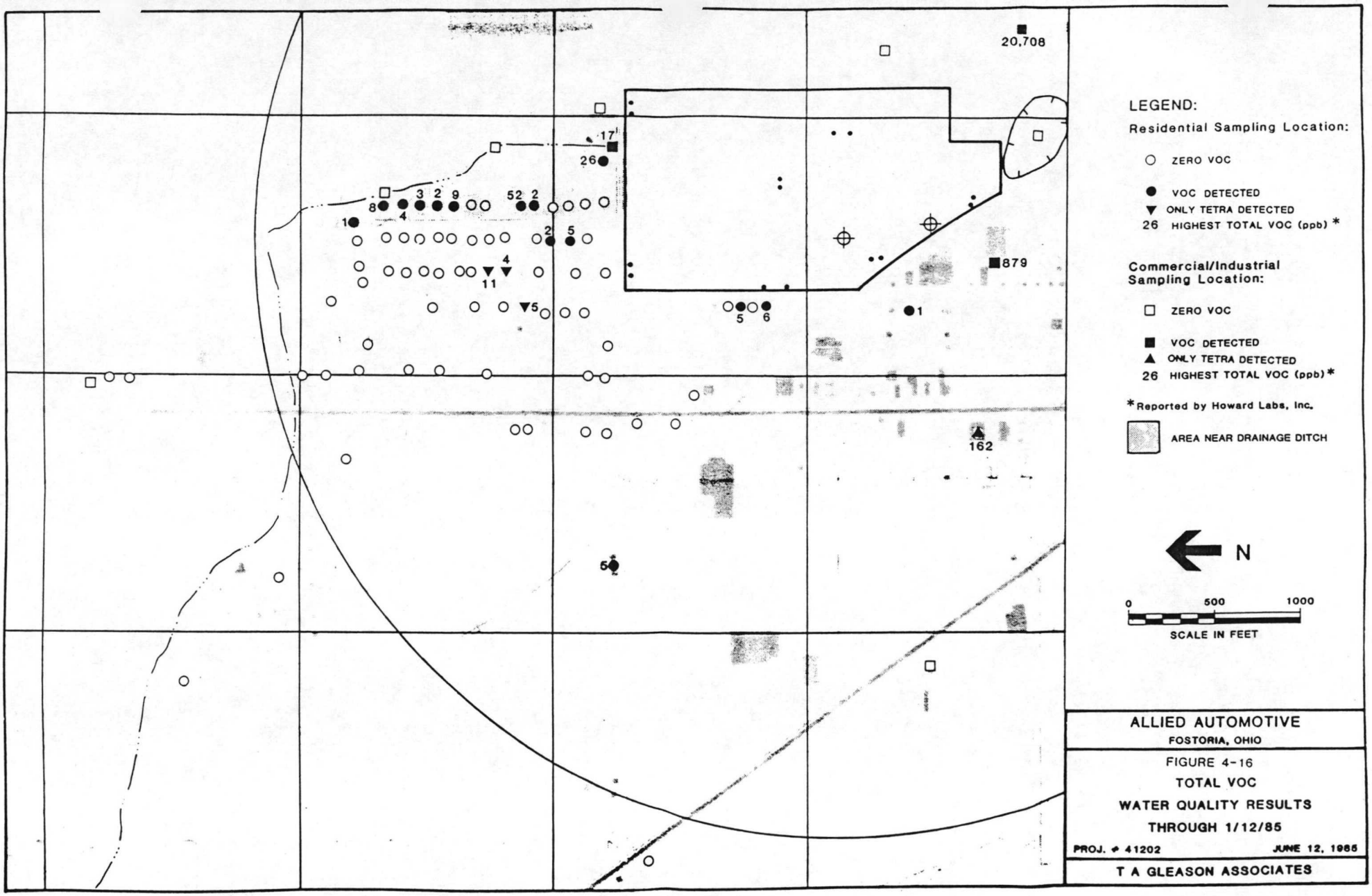


ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-15
SAMPLING AND MONITOR WELLS
NORTHWEST AREA
SAMPLED 1/10/85-1/12/85

PROJ. # 41202 JUNE 18, 1985

T A GLEASON ASSOCIATES



ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE 4-16
TOTAL VOC
WATER QUALITY RESULTS
THROUGH 1/12/85

PROJ. # 41202 JUNE 12, 1985

T A GLEASON ASSOCIATES

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

P. O. Box 27229
Cincinnati, Ohio 45227
(513) 321-9950

July 30, 1985

Mr. Rex Anderson
Allied Automotive
Autolite Division
1600 Union St.
PO Box 880
Fostoria, OH 44830

Dear Mr. Anderson:

Enclosed is an update of Table 4-6 from our "Draft Report, Hydrogeological and Groundwater Quality Investigations, for Allied Automotive, Fostoria, Ohio", dated June 19, 1985. The table now includes water quality data from the July 10/11, 1985 sampling episode.

Please call if you have any questions.

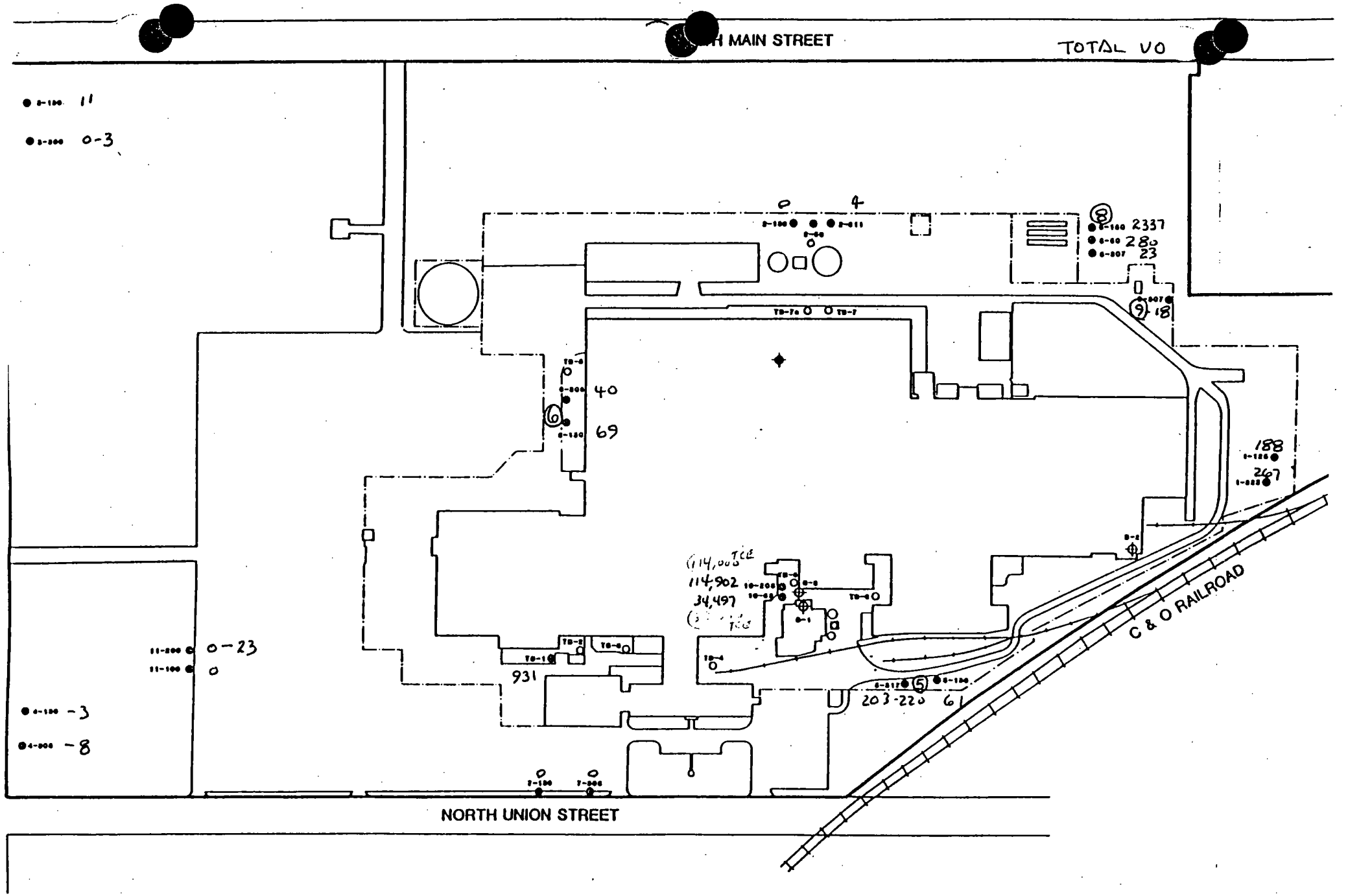
Yours Truly,

T A GLEASON ASSOCIATES

Linda A. Knauf

enc.

cc Mr. Jim Herman
Mr. Steve Robinette



SITE PLAN

DRAWING

ALLIED AUTOMOTIVE
Fostoria, Ohio

July 30, 1985

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) – Concentration in micrograms per liter								
			1,1-Dichloroethane	1,1-Dichloroethane	Trans-1,2 Dichloroethane	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethene	Tetrachloroethene	Total VOC
1-125 (40)	11/01/84	Howard	0	0	12.2	0	0	22.3	0	0	34
	02/01/85	Howard	0	0	0	6.3	0	9	0	0	15
	02/01/85	Aqua Tech	0	0	0	0	0	0	0	0	0
	07/10/85	Howard	0	0	0	16.8	0	171.0	0	0	188
1-322 (208)	12/01/84	Howard	0	0	16.5	0	0	75.3	0	0	92
	07/10/85	Howard	0	0	0	16.8	0	250.0	0	0	267
1-322 (315)	11/01/84	Howard	0	0	12.3	0	0	13.3	0	0	26
	12/01/84	Howard	0	0	11	0	0	36.7	0	0	48
	02/01/85	Howard	0	0	0	16.6	0	95.9	0	0	112
	02/01/85	Howard	0	0	0	27.9	0	153	0	0	181
	07/10/85	Howard	0	0	0	15.3	3.6	245.0	0	0	264
2-50 (38)	07/10/85	Howard	0	0	0	0	0	0	0	0	0
2-130 (123)	10/31/84	Howard	0	0	0	0	0	2.6	0	0	3
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	0	0	Trace	0	0	0
	02/01/85	Aqua Tech	0	0	0	0	0	0	0	0	0
	07/10/85	Howard	0	0	0	0	0	0	0	0	0

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 1 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

July 30, 1985

Sample Source	Date Sampled	Lab	1,1-Dichloroethene	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethene	Tetrachloroethene	Total VOC
			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
2-311 (208)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	07/10/85	Howard	0	Trace	0	0	0	4.0	0	0	4
2-311 (304)	10/30/84	Howard	0	0	.3	0	0	46.4	0	0	47
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	0	0	4.7	0	0	5
	02/01/85	Howard	0	0	0	0	0	4.9	0	0	5
	07/10/85	Howard	0	0	0	0	0	1.9	0	0	2
3-130 (40)	10/30/84	Howard	0	1.6	12	0	0	8.7	0	0	22
	02/01/85	Howard	0	0	0	8.5	0	7.4	0	0	16
	02/01/85	Aqua Tech	0	0	0	0	0	5.3	0	0	5
	07/11/85	Howard	0	0	0	7.6	0	3.3	0	0	11
3-292 (178)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	07/11/85	Howard	0	0	0	0	0	0	0	0	0
3-292 (288)	10/30/84	Howard	0	2.7	20.7	0	5.4	11.2	0	0	40
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	4.6	0	3.9	0	0	8
	02/01/85	Howard	0	0	0	5.8	0	4.3	0	0	10
	07/11/85	Howard	0	0	0	3.3	0	0	0	0	3

Notes:

(40) Average Depth (Ft) Of Opening/Screen Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

July 30, 1985

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
			1,1-Dichloroethane	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
4-130 (123)	10/30/84	Howard	0	2.5	177	0	4.8	54.7	0	0	239
	01/12/85	Howard	0	0	1	0	0	2.5	0	0	3
	07/11/85	Howard	0	0	0	1.5	0	1.5	0	0	3
4-308 (208)	12/01/84	Howard	0	0	81.5	0	0	15.1	0	0	97
	01/12/85	Howard	0	0	0	42.6	Trace	10.5	5.4	0	58
	07/11/85	Howard	0	0	0	4.7	0	2.9	0	0	8
4-308 (301)	10/30/84	Howard	0	1.1	173	0	4	26.2	0	0	204
	12/01/84	Howard	0	0	27.8	0	0	19.6	0	0	47
	01/12/85	Howard	0	0	Trace	0	0	.7	0	0	1
	07/11/85	Howard	0	0	0	3.6	0	3.0	0	0	7
5-130	10/31/84	Howard	0	0	3.5	0	3.3	23	0	2.7	32
	01/12/85	Howard	0	0	0	0	0	11.8	0	1.6	13
	07/10/85	Howard	0	0	0	16.6	0	14.8	0	0	61
5-317 (208)	12/01/84	Howard	0	0	0	0	0	18.9	0	1.1	20
	01/12/85	Howard	0	0	0	0	0	45.2	0	2.4	48
	07/10/85	Howard	0	0	0	30.3	1.9	138.0	0	0	220

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 3 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

July 30, 1985

VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter

Sample Source	Date Sampled	Lab	1,1-Dichloroethene	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethane	Total VOC
5-317 (310)	10/31/84	Howard	0	0	1.7	0	1.8	25.6	0	4.9	34
	01/12/85	Howard	0	0	0	Trace	Trace	35.7	10.8	7.2	54
	07/10/85	Howard	0	0	0	25.0	8.7	169.0	0	0	203
6-130 (123)	10/31/84	Howard	0	3.1	28.8	0	4.8	213	0	0	250
	12/01/84	Howard	0	0	11.5	0	0	126	0	0	137
	02/01/85	Howard	0	1.5	1.7	15.4	Trace	113	0	0	132
	02/01/85	Aqua Tech	0	0	7.3	0	0	59.1	0	0	66
	07/11/85	Howard	0	Trace	0	12.8	0	55.6	0	0	69
6-308 (208)	12/01/84	Howard	0	0	5.6	0	0	11.7	0	0	17
	07/11/85	Howard	0	2.8	0	11.4	0	25.6	0	0	40
6-308 (301)	10/31/84	Howard	0	3.5	17.2	0	3.3	62.1	0	0	86
	11/30/84	Howard	0	0	7.3	0	0	55.1	0	0	62
	02/01/85	Howard	0	2.7	Trace	10.8	Trace	25.8	0	0	39
	02/01/85	Howard	0	2.9	Trace	12.4	0	29.9	0	0	45
	07/11/85	Howard	0	2.8	0	13.2	0	24.8	0	0	41
7-130 (123)	11/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
	07/11/85	Howard	0	0	0	0	0	0	0	0	0

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 4 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

July 30, 1985

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) – Concentration in micrograms per liter								
			1,1-Dichloroethane	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethene	Tetrachloroethene	Total VOC
7-305 (208)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
	07/11/85	Howard	0	0	0	0	0	0	0	0	0
7-305 (298)	11/01/84	Howard	0	0	0	0	0	6.5	0	0	6
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
	07/11/85	Howard	0	0	0	0	0	0	0	0	0
8-50 (23)	03/09/85	Howard	0	0	10.6	5.4	7.5	580	0	Trace	603
	04/06/85	Howard	0	0	0	7.2	7.0	380	1.4	0	396
	07/11/85	Howard	0	0	0	6.6	12.1	258	0	3.5	280
8-150 (100)	03/09/85	Howard	0	0	21.3	5.4	8.2	1960	0	Trace	1195
	04/06/85	Howard	0	0	0	22.3	3.1	2500	1.0	0	2526
	07/11/85	Howard	0	Trace	0	36.6	0	2300	0	0	2337
8-307 (250)	03/09/85	Howard	0	0	12.1	4.7	5.6	1000	0	Trace	1032
	04/06/85	Howard	0	0	0	2.6	0	24.7	0	0	27
	07/11/85	Howard	0	0	0	2.9	0	19.8	0	0	23

Notes:
(40) Average Depth (Ft) Of Opening/Screen
Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode
Laboratories:
Aqua Tech Environmental Consultants, Inc., Marion, Ohio
Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 5 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

July 30, 1985

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
			1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethane	Total VOC
9-307 (266)	03/09/85	Howard	0	0	14.4	4.1	4.2	2550	0	4.9	2578
	04/06/85	Howard	0	0	0	2.8	0	386	0	0	389
	07/10/85	Howard	0	0	2.4	0	0	15.3	0	0	18
10-63 (60)	03/09/85	Howard	0	17.2	1050	0	18.2	2530	0	8.3	3674
	07/10/85	Howard	0	0	0	897	0	33600	0	0	34497
10-203 (196)	03/09/85	Howard	0	0	580	137	111	20500	0	100	21428
	07/10/85	Howard	0	0	0	902	0	114000	0	0	114902
TB-1	11/01/84	Howard	0	0	12.5	0	3.1	75.3	0	0	91
	01/12/85	Howard	0	0	0	21.1	Trace	50.7	Trace	Trace	72
	07/11/85	Howard	0	0	0	802	0	129	0	0	931
11-100 (45)											

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 6 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

July 30, 1985

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
			1,1-Dichloroethene	1,1-Dichloroethene	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
11-100 (90)	07/11/85 *	Howard	0	0	0	0	0	0	0	0	0
11-200 (145)	07/11/85	Howard	0	0	0	14.1	0	3.8	0	0	23
11-200 (180)	07/11/85 **	Howard	0	0	0	0	0	0	0	0	0

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

*Also found:

MEK	577
Tetrahydrofuran	2200

**Also found:

MEK	966
Tetrahydrofuran	3700

TABLE 4-6
(Page 7 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

LIST OF TABLES

TABLE 4-1

CONSTRUCTION DATA FOR WELLS B-1 AND B-2

Item	Well B1	Well B2
Well Driller	Dunbar Drilling & Supply Co.	Dunbar Drilling & Supply Co.
Date Completed	November 24, 1951	February 4, 1953
Well Number on Well Log	No. 2	No. 3
Casing Depth	23.5 feet	56 feet
Well Diameter	8-inch*	10-inch
Well Depth	295 feet	300 feet
Pump Type	Submersible	Vertical turbine
Approximate Pump Intake Depth	211 feet	150 feet

*7-inch diameter by 60-foot long casing installed in 1976.

TABLE 4-2

SOIL DEPTH AND CLASSIFICATION

Test Boring	Depth to Rock (ft)	Soil Type(s)
TB-1	5.0	Silt w/sand & clay
TB-2	6.5	Limestone fill
TB-3	7.8	Sand & weathered limestone
TB-4	12.5	4.5 ft of silt & clay fill over 8 ft of limestone fill
TB-5	10.0	6.5 ft of silty fill overlying 2 ft of limestone fill overlying 1.5 ft of sand fill
TB-6	5.5	5 ft of sandy till overlying .5 ft weathered dolomite
TB-7	9.0	9 ft of clay till with silt & sand
TB-8	6.1	4.5 ft of silt overlying 1.6 ft sand

TABLE 4-3

AUTOLITE WATER SUPPLY WELL SAMPLING EPISODES

Date	Sampled By	B-1	B-2	B-3
04/26/84	Autolite	*	*	
05/08/84	Autolite	*	*	
05/23/84	Autolite	*	*	
10/30/84	T A Gleason	*	*	
12/01/84	T A Gleason	*	*	
02/01/85	T A Gleason		*	
03/09/85	T A Gleason	*	*	
04/15/85	T A Gleason			*
04/16/85	T A Gleason			*
04/17/85	T A Gleason			*

*Sample obtained

TABLE 4-4

Monitor Well Sampling Episodes

Monitor Well	10-31 to 11-1-84	11-30 to 12-1-84	1-12-85	2-1-85	3-9-85	4-6-85
1-125	*					
1-125(40)				*		
1-322	*					
1-322(208)		*				
1-322(315)		*				
2-50(38)						
2-130	*					
2-130(123)		*		*		
2-311	*					
2-311(208)		*				
2-311(304)		*		*		
3-130	*					
3-130(40)				*		
3-292	*					
3-292(178)		*				
3-292(288)		*		*		
4-130	*					
4-130(123)			*			
4-308	*					
4-308(208)		*	*			
4-308(301)		*	*			
5-130	*		*			
5-317	*					
5-317(208)		*	*			
5-317(310)		*	*			
6-130	*					
6-130(123)		*		*		
6-308	*					
6-308(208)		*				
6-308(301)		*		*		
7-130	*					
7-130(123)			*			
7-305	*					
7-305(208)		*	*			
7-305(298)		*	*			

*Samples Obtained

TABLE 4-4 (Continued)

Monitor Well	10-31 to 11-1-85	11-30 to 12-1-85	1-12-85	2-1-85	3-9-85	4-6-85
8-50					*	*
8-150(100)					*	*
8-307(100)					*	*
9-307(226)					*	*
10-63(60)					*	
10-203(196)					*	
TB-1	*		*			
11-100(45)						
11-100(90)						
11-200(145)						
11-200(180)						

*Samples Obtained

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
1-125 (40)	11/01/84	Howard	0	0	12.2	0	0	22.3	0	0	34
	02/01/85	Howard	0	0	0	6.3	0	9	0	0	15
	02/01/85	Aqua Tech	0	0	0	0	0	0	0	0	0
1-322 (208)	12/01/84	Howard	0	0	16.5	0	0	75.3	0	0	92
1-322 (315)	11/01/84	Howard	0	0	12.3	0	0	13.3	0	0	26
	12/01/84	Howard	0	0	11	0	0	36.7	0	0	48
	02/01/85	Howard	0	0	0	16.6	0	95.9	0	0	112
	02/01/85	Howard	0	0	0	27.9	0	153	0	0	181
2-50 (38)											
2-130 (123)	10/31/84	Howard	0	0	0	0	0	2.6	0	0	3
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	0	0	Trace	0	0	0
	02/01/85	Aqua Tech	0	0	0	0	0	0	0	0	0

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 1 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
2-311 (208)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
2-311 (304)	10/30/84	Howard	0	0	.3	0	0	46.4	0	0	47
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	0	0	4.7	0	0	5
	02/01/85	Howard	0	0	0	0	0	4.9	0	0	5
3-130 (40)	10/30/84	Howard	0	1.6	12	0	0	8.7	0	0	22
	02/01/85	Howard	0	0	0	8.5	0	7.4	0	0	16
	02/01/85	Aqua Tech	0	0	0	0	0	5.3	0	0	5
3-292 (178)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
3-292 (288)	10/30/84	Howard	0	2.7	20.7	0	5.4	11.2	0	0	40
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	02/01/85	Howard	0	0	0	4.6	0	3.9	0	0	8
	02/01/85	Howard	0	0	0	5.8	0	4.3	0	0	10

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 2 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethane	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
4-130 (123)	10/30/84	Howard	0	2.5	177	0	4.8	54.7	0	0	239
	01/12/85	Howard	0	0	1	0	0	2.5	0	0	3
4-308 (308)	12/01/84	Howard	0	0	81.5	0	0	15.1	0	0	97
	01/12/85	Howard	0	0	0	42.6	Trace	10.5	5.4	0	58
4-308 (301)	10/30/84	Howard	0	1.1	173	0	4	26.2	0	0	204
	12/01/84	Howard	0	0	27.8	0	0	19.6	0	0	47
	01/12/85	Howard	0	0	Trace	0	0	.7	0	0	1
5-130	10/31/84	Howard	0	0	3.5	0	3.3	23	0	2.7	32
	01/12/85	Howard	0	0	0	0	0	11.8	0	1.6	13
5-317 (208)	12/01/84	Howard	0	0	0	0	0	18.9	0	1.1	20
	01/12/85	Howard	0	0	0	0	0	45.2	0	2.4	48

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 3 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethane	1,1-Dichloro-ethene	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
5-317 (310)	10/31/84	Howard	0	0	1.7	0	1.8	25.6	0	4.9	34
	01/12/85	Howard	0	0	0	Trace	Trace	35.7	10.8	7.2	54
6-130 (123)	10/31/84	Howard	0	3.1	28.8	0	4.8	213	0	0	250
	12/01/84	Howard	0	0	11.5	0	0	126	0	0	137
	02/01/85	Howard	0	1.5	1.7	15.4	Trace	113	0	0	132
	02/01/85	Aqua Tech	0	0	7.3	0	0	59.1	0	0	66
6-308 (208)	12/01/84	Howard	0	0	5.6	0	0	11.7	0	0	17
6-308 (301)	10/31/84	Howard	0	3.5	17.2	0	3.3	62.1	0	0	86
	11/30/84	Howard	0	0	7.3	0	0	55.1	0	0	62
	02/01/85	Howard	0	2.7	Trace	10.8	Trace	25.8	0	0	39
	02/01/85	Howard	0	2.9	Trace	12.4	0	29.9	0	0	45
7-130 (123)	11/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 4 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloroethene	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
7-305 (208)	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
7-305 (298)	11/01/84	Howard	0	0	0	0	0	6.5	0	0	6
	12/01/84	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
8-50 (23)	03/09/85	Howard	0	0	10.6	5.4	7.5	580	0	Trace	603
	04/06/85	Howard	0	0	0	7.2	7.0	380	1.4	0	396
8-150 (100)	03/09/85	Howard	0	0	21.3	5.4	8.2	1960	0	Trace	1195
	04/06/85	Howard	0	0	0	22.3	3.1	2500	1.0	0	2526
8-307 (250)	03/09/85	Howard	0	0	12.1	4.7	5.6	1000	0	Trace	1032
	04/06/85	Howard	0	0	0	2.6	0	24.7	0	0	27

Notes:

(40) Average Depth (Ft) Of Opening/Screen Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 5 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloroethene	1,1-Dichloroethane	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
9-307 (266)	03/09/85	Howard	0	0	14.4	4.1	4.2	2350	0	4.9	2578
	04/06/85	Howard	0	0	0	2.8	0	386	0	0	389
10-63 (60)	03/09/85	Howard	0	17.2	1050	0	18.2	2580	0	8.3	3674
10-203 (196)	03/09/85	Howard	0	0	580	137	111	20500	0	100	21428
TB-1	11/01/84	Howard	0	0	12.5	0	3.1	75.3	0	0	91
	01/12/85	Howard	0	0	0	21.1	Trace	50.7	Trace	Trace	72
11-100 (45)											

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 6 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloroethane	1,1-Dichloroethane	Trans-1,2 Dichloroethane	Cis-1,2 Dichloroethane	1,1,1-Trichloroethane	Trichloroethane	1,2-Dichloroethane	Tetrachloroethane	Total VOC
11-100 (90)											
11-200 (145)											
11-200 (180)											

Notes:

(40) Average Depth (Ft) Of Opening/Screen

Sampling Tubes Were Installed Subsequent to 10/30/84-11/1/84 Sampling Episode

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-6
(Page 7 of 7)

ON-SITE MONITOR WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

TABLE 4-7

AQUIFER CHARACTERISTICS CALCULATED FROM
TIME-DRAWNDOWN DATA

Well	Transmissivity (T)	Storage Coefficient (S)
2-311	17,740	.030
3-294	27,720	.009
4-308	47,948	.019
5-317	6,822	.030
6-308	13,647	.091
7-305	12,320	.025
10-203	6,336	.361
11-200	25,711	.016

TABLE 4-8

AQUIFER CHARACTERISTICS CALCULATED
FROM DISTANCE-DRAWDOWN DATA

Time After Pumping Began	Transmissivity (T)	Storage Coefficient (S)
1,000 minutes	19,283	.022
2,000 minutes	17,058	.026
3,000 minutes	19,283	.031
5,000 minutes	15,035	.019

Sample Source[1]	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter: 1,1-Dichloroethene	1,1-Dichloroethene	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
R-7	11/13/84	Howard[2]	0	0	26.7	0	0	23.4	0	1.5	52
James Harris 1712 Walnut St.	11/13/84	Aqua Tech[3]	0	0	5.3	0	0	14.4	0	0	20
R-10	11/13/84	Howard	0	0	3.5	0	0	4.7	0	.6	9
John Peifer 1720 Walnut St.	11/13/84	Aqua Tech	0	0	1.5	0	0	2.7	0	0	4
R-26	11/13/84	Howard	0	0	0	0	0	0	0	0	0
Warren Overly 1707 Walnut St.	11/13/84	Aqua Tech	0	0	0	0	0	0	0	0	0
R-53	11/13/84	Howard	0	0	0	0	0	4.6	0	0	5
Duane Vogel 1667 N. Union St.	11/13/84	Aqua Tech	0	0	0	0	0	1.7	0	0	2
R-54	11/13/84	Howard	0	0	0	0	0	0	0	0	0
Clyde Strousburg 1665 N. Union St.	11/13/84	Aqua Tech	0	0	.5	0	0	1	0	0	2

1 See Figure 4-14 Sampling and Monitor Well Locations (NW Area)

2 Howard Labs, Dayton, Ohio

3 Aqua Tech, Melmore, Ohio

Table 4-9
(Page 1 of 2)

Sampling of Six Private Residence Wells
(11/13/84)

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES G

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
			1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
R-55	11/13/84	Howard	0	0	0	0	0	5.8	0	0	6
Ralph McClung	11/13/84	Aqua Tech	0	0	0	0	0	.9	0	0	1
1651 N. Union St											

Table 4-9
(Page 2 of 2)

Sampling of Six Private Residence Wells
(11/13/84)

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CHEMICALS (VOC) - Concentration in micrograms per liter									
Sample Source	Date Sample	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Vinyl Chloride
MURRAY	05/23/84	ETC	-	-	ND1	-	ND1	ND1	-	ND1	ND1
STEINCREST		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
		AQUA	-	-	-	-	<1	-	-	-	

NOTES:

Laboratories:

Aqua Tech Environmental Consultants, Inc.
Marion, Ohio

Allied Labs
Buffalo, New York

ETC
Edison, New York

TABLE 4-9A
SAMPLING OF SIX PRIVATE WELLS
(5/23/84)

GROUNDWATER INVESTIGATIONS
AUTOLITE
FOSTORIA, OHIO
PROJECT # 40601

T A GLEASON ASSOCIATES

- = NOT ANALYZED
ND1 = IS NOT PRESENT AT ANY DETECTABLE CONCENTRATION
ND2 = NOT DETECTED AT THE 10 PPB LIMIT OF DETECTION
BMDL = BELOW MDL WHERE MDL IS 10 PPB

			VOLATILE ORGANIC CHEMICALS (VOC) - Concentration in micrograms per liter									
Sample Source	Date Sample	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Vinyl Chloride
JOLLY'S	05/23/84	ETC	-	-	NDI	-	NDI	BMDL	-	NDI	NDI
DRIVE IN		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
C11		AQUA	-	-	-	-	-	<1	-	-	-
BRANDEBERRY	05/23/84	ETC	-	-	NDI	-	NDI	NDI	-	NDI	NDI
4509 NORTH		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
US 23		AQUA	-	-	-	-	-	<1	-	-	-
11 26											
GREEGOR	05/23/84	ETC	-	-	NDI	-	NDI	BMDL	-	NDI	NDI
1702 WALNUT		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
		AQUA	-	-	-	-	-	1,1	-	-	-
11 2											
HAGENMOIER	05/23/84	ETC	-	-	NDI	-	NDI	NDI	-	BMDL	NDI
1751 N. UNION		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
		AQUA	-	-	-	-	-	<1	-	-	-
11 4											
MUNSEY	05/23/84	ETC	-	-	NDI	-	NDI	NDI	-	NDI	NDI
225 BACHMAN		ALLIED	-	-	ND2	-	ND2	ND2	-	ND2	ND2
		AQUA	-	-	-	-	-	<1	-	-	-
11 10											

- = NOT ANALYZED
NDI = IS NOT PRESENT AT ANY DETECTABLE CONCENTRATION
ND2 = NOT DETECTED AT THE 10 PPB LIMIT OF DETECTION
BMDL = BELOW MDL, WHERE MDL IS 10 PPB

NOTES:

Laboratories:

Aqua Tech Environmental Consultants, Inc.
Marion, Ohio

Allied Labs
Buffalo, New York

ETC
Edison, New Jersey

TABLE 4-9A
SAMPLING OF SIX PRIVATE WELLS
(5/23/84)

GROUNDWATER INVESTIGATIONS
AUTOLITE
FOSTORIA, OHIO
PROJECT # 40601

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) – Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethane	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethene	Tetra-chloroethene	Total VOC
R-1	01/11/85	Aqua Tech	0	0	22.4	0	0	17.9	0	0	40
	01/11/85	Howard	0	0	10.8	0	0	11.2	0	4	26
R-2	05/23/84	Aqua Tech	0	0	0	0	0	1.1	0	0	1
	01/10/85	Aqua Tech	0	0	0	0	0	0	0	0	0
	01/10/85	Howard	0	0	0	0	0	0	0	0	0
R-5	01/12/85	Aqua Tech	0	0	0	0	0	.8	0	0	1
	01/12/85	Howard	0	0	0	0	0	0	0	0	0
R-6	01/10/85	Aqua Tech	0	0	1.0	0	0	3.2	0	0	4
	01/10/85	Howard	0	0	0	0	0	1.6	0	0	2
R-7	11/13/84	Howard	0	0	26.7	0	0	23.4	0	1.5	52
	11/13/84	Aqua Tech	0	0	5.3	0	0	14.4	0	0	20
	01/04/85	Howard	0	0	0	1	0	9.8	0	0	11
		Aqua Tech									

Notes:
Laboratories:
Aqua Tech Environmental Consultants, Inc., Marion, Ohio
Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 1 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloroethene	1,1-Dichloroethene	Trans-1,2 Dichloroethene	Cis-1,2 Dichloroethene	1,1,1-Trichloroethane	Trichloroethene	1,2-Dichloroethane	Tetrachloroethene	Total VOC
R-8	01/10/85	Howard	0	0	0	0	0	0	0	0	0
	01/10/85	Aqua Tech	0	0	0	0	0	1.9	0	0	2
R-9	01/10/85	Howard	0	0	0	0	0	0	0	0	0
	01/10/85	Aqua Tech	0	0	1.3	0	0	2.1	0	0	3
R-10	11/13/84	Howard	0	0	3.5	0	0	4.7	0	.6	9
	11/13/84	Aqua Tech	0	0	1.5	0	0	2.7	0	0	4
	01/04/85	Howard	0	0	0	0	0	4.1	0	0	4
		Aqua Tech									
R-11	01/10/85	Howard	0	0	0	0	0	2.1	0	0	2
	01/10/85	Aqua Tech	0	0	0	.7	0	1.7	0	0	2
R-12	01/10/85	Howard	0	0	1.6	0	0	1.4	0	0	3
	01/10/85	Aqua Tech	0	0	3.5	0	0	3.8	0	0	7

Notes:

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 2 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
R-13	12/11/84	Aqua Tech	0	0	8.8	0	0	4.1	0	0	13
	12/10/84	Howard	0	0	0	0	0	0	0	0	0
	01/04/85	Howard	0	0	0	Trace	0	4.3	0	0	4
	01/04/85	Aqua Tech									
R-14	01/10/85	Howard	0	0	8.4	0	0	0	0	0	8
	01/10/85	Aqua Tech	0	0	25.9	0	0	0	0	0	26
R-15	01/10/85	Howard	0	0	1.2	0	0	0	0	0	1
	01/10/85	Aqua Tech	0	0	19.1	0	0	1.7	0	0	21
R-20	01/10/85	Aqua Tech	0	0	7.6	0	0	6.6	0	0	14
	01/10/85	Howard	0	0	0	0	0	0	0	0	0
R-21	01/12/85	Aqua Tech	0	0	0	0	0	1.2	0	0	1
	01/12/85	Howard	0	0	0	0	0	0	0	0	0

Notes:
Laboratories:
Aqua Tech Environmental Consultants, Inc., Marion, Ohio
Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 3 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
R-23	01/10/85	Aqua Tech	0	0	0	0	0	1.7	0	0	2
	01/10/85	Howard	0	0	0	0	0	0	0	0	0
R-24	01/10/85	Aqua Tech	0	0	0	0	0	1.3	0	0	1
	01/10/85	Howard	0	0	0	0	0	0	0	0	0
R-25	01/10/85	Aqua Tech	0	0	0	0	0	1.1	0	0	1
	01/10/85	Howard	0	0	0	0	0	0	0	0	0
R-26	01/04/85	Howard	0	0	0	0	0	2.3	0	0	2
	01/04/85	Aqua Tech			.8			4.1			5
R-27	12/10/84	Howard	0	0	0	0	0	0	0	0	0
	12/10/84	Aqua Tech	0	0	0	0	2.1	0	0	0	2
	01/04/85	Howard	0	0	0	0	0	4.6	0	0	5
	01/04/85	Aqua Tech						2.2			2

Notes:

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 4 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

Sample Source	Date Sampled	Lab	VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
			1,1-Dichloro-ethene	1,1-Dichloro-ethene	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethane	Total VOC
R-33	01/11/85	Aqua Tech	0	0	0	0	0	0	0	12.3	12
	01/11/85	Howard	0	0	0	0	0	0	0	3.7	4
R-34	01/11/85	Aqua Tech	0	0	1.7	0	1.1	.7	0	21.8	25
	01/11/85	Howard	0	0	0	0	0	0	0	11.4	11
R-35	01/10/85	Howard	0	0	0	0	0	0	0	0	0
	01/10/85	Aqua Tech	0	0	0	0	1.5	0	0	2.6	4
R-36	01/11/85	Aqua Tech	0	0	0	0	0	0	0	1.3	1
	01/11/85	Howard	0	0	0	0	0	0	0	0	0
R-45	01/11/85	Aqua Tech	0	0	0	0	0	0	0	3.5	4
	01/11/85	Howard	0	0	0	0	0	0	0	0	0

Notes:

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 5 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
R-46	01/11/85	Aqua Tech	0	0	0	0	0	0	0	1.3	1
	01/11/85	Howard	0	0	0	0	0	0	0	0	0
R-47	01/12/85	Aqua Tech	0	0	0	0	0	0	0	6.8	7
	01/12/85	Howard	0	0	0	0	0	0	0	4.7	5
R-53	11/13/84	Howard	0	0	0	0	0	4.6	0	0	5
	11/13/84	Aqua Tech	0	0	0	0	0	1.7	0	0	2
	01/04/85	Howard	0	0	0	0	0	0	0	0	0
	01/12/85	Aqua Tech	0	0	1.2	0	0	2.4	0	0	4
	01/12/85	Howard	0	0	0	0	0	1.4	0	1.3	3
	01/04/85	Aqua Tech									
R-54	11/13/84	Howard	0	0	0	0	0	0	0	0	0
	11/13/84	Aqua Tech	0	0	.5	0	0	1	0	0	2
	01/04/85	Howard	0	0	0	0	0	0	0	0	0
	01/04/85	Aqua Tech									
R-55	11/13/84	Howard	0	0	0	0	0	5.8	0	0	6
	11/13/84	Aqua Tech	0	0	0	0	0	.9	0	0	1
	01/12/85	Aqua Tech	0	0	0	0	0	1.4	0	0	1
	01/12/85	Howard	0	0	0	0	0	0	0	0	0

Notes:

Laboratories:

Aqua Tech Environmental Consultants, Inc., Marion, Ohio

Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 6 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

			VOLATILE ORGANIC CONSTITUENT (VOC) - Concentration in micrograms per liter								
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethene	1,1-Dichloro-ethene	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
R-59	01/11/85	Aqua Tech	0	0	0	0	0	0	0	2.8	3
	01/11/85	Howard	0	0	0	0	0	0	1.1	0	1
R-61	01/11/85	Aqua Tech	0	0	0	0	0	7.4	0	0	7
	01/11/85	Howard	0	0	0	0	0	0	0	0	0
R-84	12/10/84	Aqua Tech	0	0	.8	0	2.2	0	0	0	3
	12/10/84	Howard	0	0	0	0	0	0	0	0	0
	01/04/85	Howard	0	0	0	0	0	5.2	0	0	5
	01/04/85	Aqua Tech									
R-97	12/10/84	Howard	0	0	0	0	0	0	0	0	0
	12/10/84	Aqua Tech	0	0	0	0	0	0	0	0	0
R-99	12/12/84	Howard	0	0	0	0	0	0	0	0	0
	12/12/84	Aqua Tech									

Notes:
Laboratories:
Aqua Tech Environmental Consultants, Inc., Marion, Ohio
Howard Labs, Inc., Dayton, Ohio

TABLE 4-16
(Page 7 of 7)

RESIDENTIAL WELLS

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

			VOLATILE ORGANIC CONSTITUENT (VOC) – Concentration in micrograms per liter									
Sample Source	Date Sampled	Lab	1,1-Dichloro-ethane	1,1-Dichloro-ethane	Trans-1,2 Dichloro-ethene	Cis-1,2 Dichloro-ethene	1,1,1-Tri-chloroethane	Trichloro-ethene	1,2-Dichloro-ethane	Tetra-chloroethene	Total VOC
C-12 (Surface)	01/03/85	Howard	0	0	1.3	0	0	11.2	0	0	12
(Surface)	01/03/85	Howard	0	0	1	0	0	9.3	0	0	10
(10')	01/03/85	Howard	0	1	1.2	0	0	17.5	0	0	20
(10')	01/03/85	Howard	0	0	0	5.2	0	15.1	0	0	20
(18')	01/03/85	Howard	0	0	0	6.3	0	16.2	0	0	22
(21')	01/03/85	Howard	0	0	0	0	0	0	0	0	0
(22')	01/03/85	Howard	0	0	1.5	0	0	10.5	0	0	12
(23')	01/03/85	Howard	0	0	0	0	0	0	0	0	0
(25')	01/03/85	Howard	0	0	0	0	0	0	0	0	0
C-14 (No. of Jones Rd. in ditch)	01/04/85	Howard	0	0	0	0	17.4	0	0	0	17

Notes:
Laboratories:
Aqua Tech Environmental Consultants, Inc., Marion, Ohio
Howard Labs, Inc., Dayton, Ohio

TABLE 4-18
(Page 1 of 1)

SURFACE WATER SAMPLES

GROUNDWATER INVESTIGATIONS
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

T A GLEASON ASSOCIATES

APPENDIX A

- GEOLOGY
- B-1 and B-2 WELL LOGS
- TEST BORING LOGS
- MONITOR WELL COMPLETION LOGS
- ONSITE and OFFSITE WATER LEVEL MEASUREMENTS, HYDRAULIC TESTING
- WELL SAMPLING DIAGRAMS

5.0 GEOLOGY & GROUNDWATER HYDROLOGY

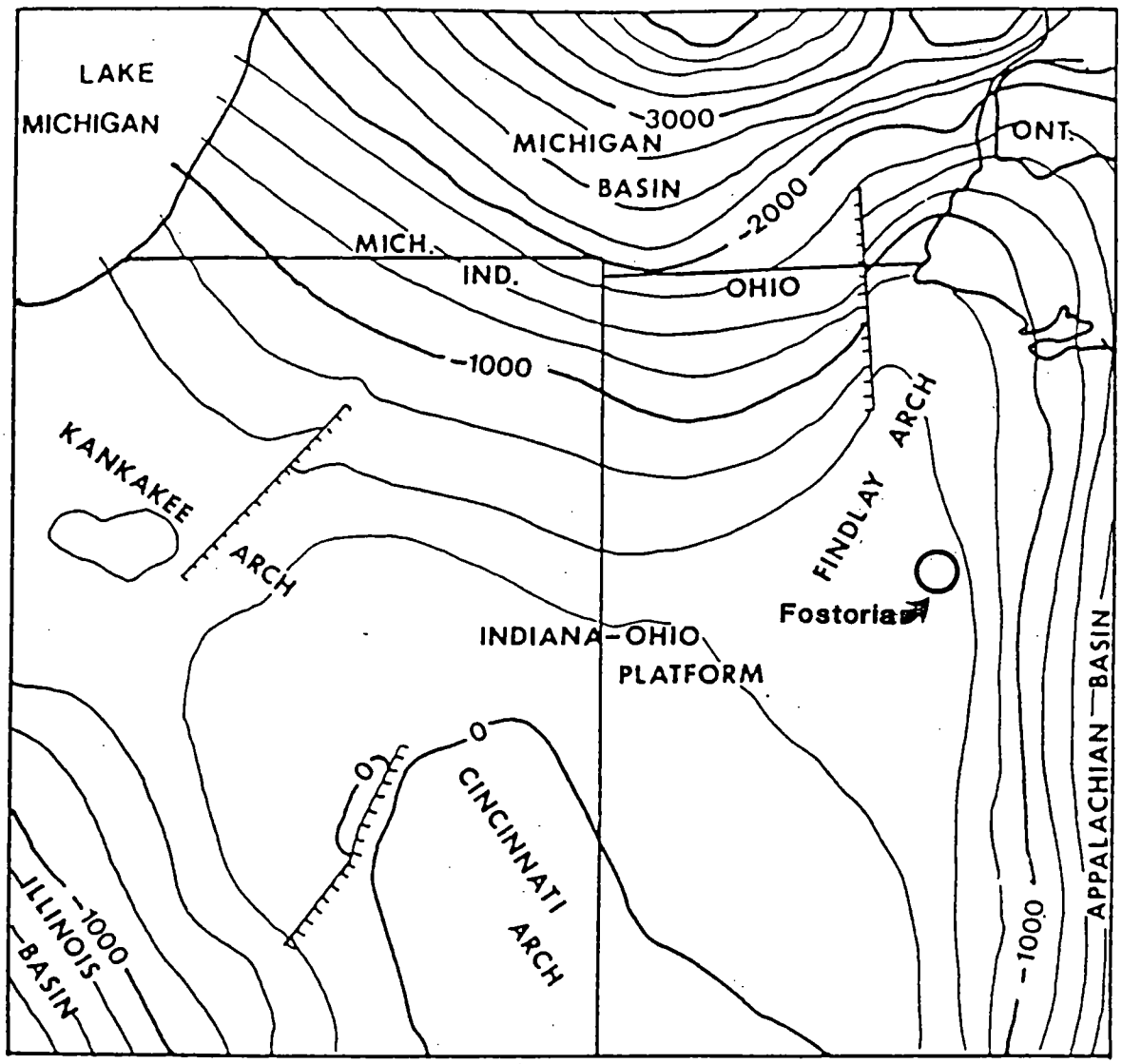
5.1 STRUCTURAL SETTING

Fostoria, Ohio is located on the eastern flank of the Findlay Arch in northwestern Ohio. The Findlay Arch system is a northeast trending extension of the Cincinnati Arch system (Figure A-1), which is an area of structural highs bordered by the Appalachian Basin to the east, the Michigan Basin to the north, and the Illinois Basin to the southwest. The current consensus is that the arch system came into structural relief through differential subsidence of its surrounding basins rather than tectonic uplift of the arch.

5.2 STRATIGRAPHY

The Lockport Group, Middle Silurian in age, is exposed as bedrock along the crest of the Findlay Arch (Figure A-2). The Lockport is underlain by the Lower Silurian Rochester shale, a distinctive marker for the base of the Lockport when drilling. In the vicinity of the Autolite plant the Lockport is overlain by approximately 10 feet of glacial till.

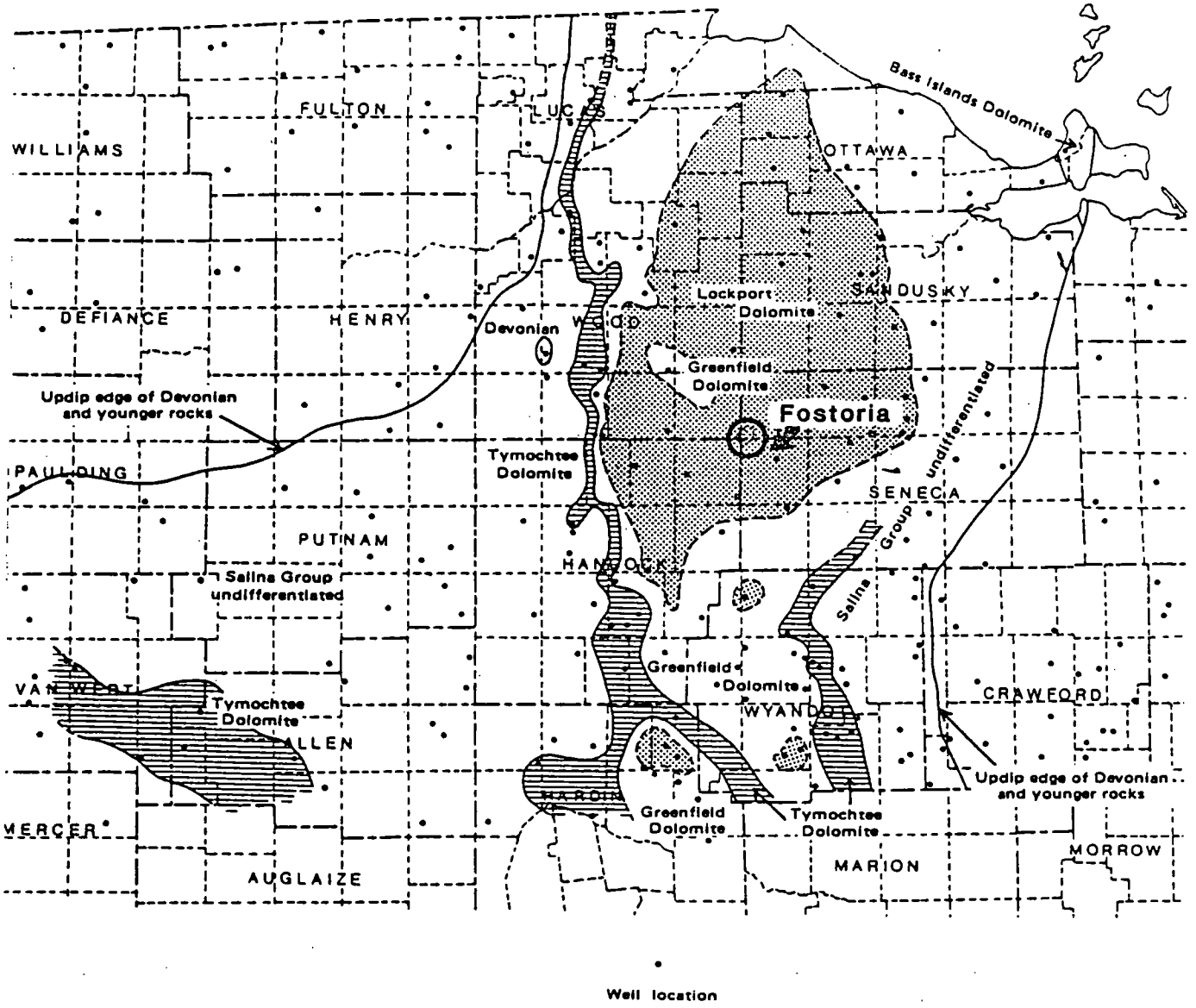
In some areas of the state the Lockport Group can be subdivided into three formations: the basal Gasport Dolomite, the Goat Island Dolomite, and the Geulph Dolomite (Janssens, 1977). According to Janssens, the distinctive chert-bearing Goat Island Dolomite is absent in northwestern Ohio, making the subdivision of the Lockport difficult. In this area the



CONTOUR INTERVAL: 250 FEET

Source: Shaver, 1974

ALLIED AUTOMOTIVE FOSTORIA, OHIO
FIGURE A-1 STRUCTURE CONTOURS ON TOP OF TRENTON FORMATION
PROJ. # 41202 MAY 17, 1985
T A GLEASON ASSOCIATES



ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-2

SILURIAN BEDROCK GEOLOGY OF NORTHWESTERN OHIO

PROJ. # 41202 MAY 23, 1985

T A GLEASON ASSOCIATES

Lockport Group is therefore known as the undifferentiated Lockport Dolomite. Fostoria is located on the undifferentiated Lockport Dolomite, which is predominantly beige-to-gray vuggy fossiliferous dolomite, with the basal 30 to 85 feet being a dark gray microcrystalline dolomite that commonly has white mottling.

Stratigraphically, the Lockport Dolomite is overlain by the Greenfield Dolomite, which, according to many studies, was eroded from the crest of the Findlay Arch. However, Janssens (1977) identified Seneca County as part of an area in which the Lockport-Greenfield contact is anomalous. Several wells in central and western Seneca County show an upper section of microcrystalline brown dolomite that is lithologically similar to the Greenfield. Test boring 1 at the Autolite site shows the upper 40 feet of bedrock to be a buff to brown microcrystalline dolomite similar to the Greenfield Dolomite. Janssens mapped a large area of Greenfield bedrock in eastern Wood County (Figure A-2). Although Janssens did not extend the Greenfield Dolomite to the Fostoria area, he considers the matter unresolved, and further studies may conclude that the upper section of bedrock under the Autolite site is Greenfield Dolomite.

5.3 BEDROCK GEOLOGY

The Cincinnati Arch system and its associated basins represent a platform upon which a shallow Paleozoic sea deposited carbonate sediments. As the sea transgressed and regressed, reefs and bryzoan mounds, along with associated interreef deposits, developed during times of high sea levels. Wave

action and currents affected the deposition of reef talus and other fossil fragment accumulations adjacent to the reefs. During periods of low sea level, fine-grained lagoonal and intertidal lime muds were deposited. When sea level fell sufficiently, these carbonates become subaerially exposed, allowing erosion along the crest of the Findlay Arch and porosity development by groundwater movement. The Findlay Arch was a positive paleogeographic feature throughout the Paleozoic (Norris, et al., 1971), and no doubt was an emergent land mass periodically during this time. Near the end of the Paleozoic era the sea retreated from the entire region and the Findlay Arch became a positive feature of the central lowlands physiographic province. From the close of the Paleozoic to the initiation of Cenozoic glaciation, erosion removed most of the post-Lockport age rocks from the crest of the arch. Subsequent glaciation deposited a blanket of rather impermeable till of varying thickness over the area.

Since these carbonates were originally deposited as calcite and aragonite ($CaCO_3$), and are now dolomite ($CaMg[CO_3]_2$), extensive diagenetic alteration has occurred. There are two basic requirements for the dolomitization of a limestone: a sufficient source of magnesium, and a mechanism to flush large volumes of magnesium-rich water through the rock. There are several proposed models for the dolomitization of limestone; however, there is no general agreement among geologists of any single model that would cause such widespread dolomization of these Silurian carbonates. Two models seem to be most applicable: the mixed water model, and the shale dewatering

model. The mixed water model requires the mixing of fresh water and marine water or formation brine. Badiozamani (1973) calculated that a brackish water with 5 to 30 percent sea water would be undersaturated with respect to calcite and many times supersaturated with respect to dolomite. In this model sea water or saline groundwater provided a continuous supply of magnesium while mixing with fresh meteoric water. During subaerial exposure the interface between the meteoric fresh water and the underlying marine water or formation brine would be a dolomitizing zone. This interface could pass through and dolomitize a considerable section of sediment as sea level dropped. Similar conditions would occur as sea level rose.

The shale dewatering model, in which magnesium-rich pore water is expelled from shales during compaction, should also be considered. Since the basins surrounding the Findlay Arch may have formed by differential subsidence, a considerable amount of magnesium-rich pore water may have been generated. The precipitation of evaporites such as anhydrite ($CaSO_4$) took much calcium out of solution, increasing the magnesium-calcium ratio and further promoting dolomitization.

5.4 THE LOCKPORT DOLOMITE AQUIFER OF THE FOSTORIA AREA

One comprehensive hydrologic study of carbonate aquifers in northwestern Ohio (Ohio Water Plan Inventory Report No. 22, 1970) makes three basic assumptions concerning carbonate aquifers in northwestern Ohio: "1, the permeability of the aquifer is derived from joints, fractures and solution channels; 2, the fractures are interconnected on an area basis; 3, the extreme variability in the occurrence and movement of

groundwater seldom approaches that of karst-type terranes." The conclusions drawn from detailed study of the Lockport Dolomite in the Fostoria area, as discussed in the next section support these assumptions. We found a conformable piezometric surface in the vicinity of Fostoria, and even though there are well-to-well inconsistencies, the water level map indicates a rather uniform flow of groundwater to the northwest. We find that in the Fostoria area virtually every well drilled into the Lockport Dolomite produces water, wheareas in a karst terrane it is not unusual for more than 50 percent of wells drilled to be dry.

White (1972), who visualized various conceptual models for carbonate aquifers, would consider the Lockport Dolomite a "diffuse-flow carbonate aquifer." Diffuse-flow aquifers have not had extensive solution activity; this is typical for dolomite rocks, which are less soluble than limestones. Water movement in this type of aquifer is along joints and bedding planes that have only been modestly affected by solution. The water table in diffuse-flow aquifers is usually well defined.

5.5 THE LOCKPORT DOLOMITE AQUIFER AT THE AUTOLITE SITE

A detailed evaluation of the Lockport Dolomite in the Fostoria region was conducted using the following methods:

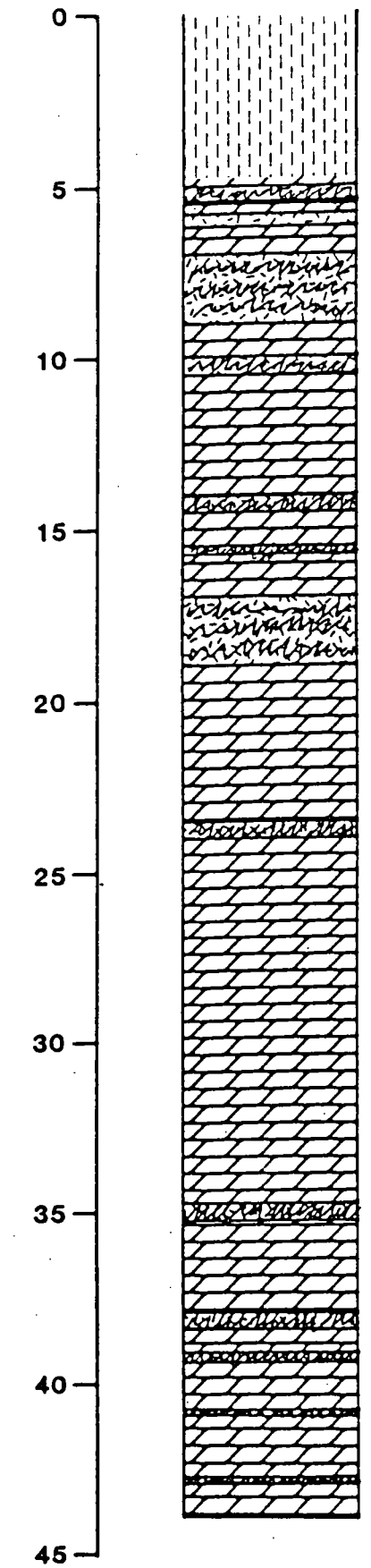
1. Literature search
2. Examination of cuttings and corings
3. Observations during drilling, such as drill bit behavior and changes in the color of produced water
4. Measured water flow during drilling
5. Hydraulic tests at strategic locations

From this evaluation we conclude that virtually all porosity in this aquifer is secondary porosity consisting of fractures, solution cavities and dolomitic intercrystalline porosity. Examination of cuttings and a core suggests that fractures and solution cavities control groundwater flow to a large extent in the vicinity of the Autolite site. This evidence further indicates that the fractures and solution cavities are related, with fractures controlling the distribution of solution cavities and providing the necessary interconnections between pore spaces for water to flow.

5.5.1 CORE, CUTTINGS AND DRILLING DATA

One continuous core (TB-1), representing the upper 44 feet of the aquifer on the Autolite site, was examined in detail regarding lithology and porosity development. All of the core is a light gray to light brown microcrystalline dolomite. Vuggy porosity with minor moldic porosity is present in varying amounts throughout the core. Moldic porosity is formed when fossil fragments are dissolved, leaving a distinctive mold in the rock matrix. Vugs are solution cavities having no distinctive shape to suggest fossil origins; many vugs are solution enlarged molds. The vugs and molds in the core range in size from pinpoint to one-quarter inch. These vugs and molds comprise a porosity of approximately 5 to 10 percent, but are not well interconnected and would flow little or no water.

The core is cut by numerous horizontal fractures spaced 2 to 11 inches apart. Most of the fractures are iron stained, yellow-brown to brown, and many have dolomite crystals lining the fracture faces. Along the fractures vugs and molds are enlarged to irregular solution cavities. Indicated on the core log (Figure A-3) are 2-inch- to 2-foot-thick fracture zones where the rock is heavily altered adjacent to the fractures.



Brown clayey silt, minor sand

Fracture/solution channel zone.
Brown clay in vugs.

Single horizontal fractures spaced 3" apart.
Some fracture faces crystal-lined.
1"-2" vugs along fractures.

Iron stained fracture faces, rounded clasts in fracture zone.

Fracture/solution channel zone, loose friable pieces, iron stained, some crystal coated rock faces.

Single horizontal fractures spaced 2"-6" apart, minor short vertical fractures, 1"-2" vugs associated with fractures.

Fracture /solution channel zone.

Single horizontal fractures spaced 2"-8" apart, some iron stained, some crystal coated 2" irregular solution cavities associated with fractures.

Fracture/solution channel zone, loose rounded clasts.

LEGEND:

- CLAYEY SILT
- FRACTURE/SOLUTION CHANNEL ZONE
- DOLOMITE

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-3

TEST BORING 1

CORE LOG

PROJ. # 41202 MAY 17, 1985

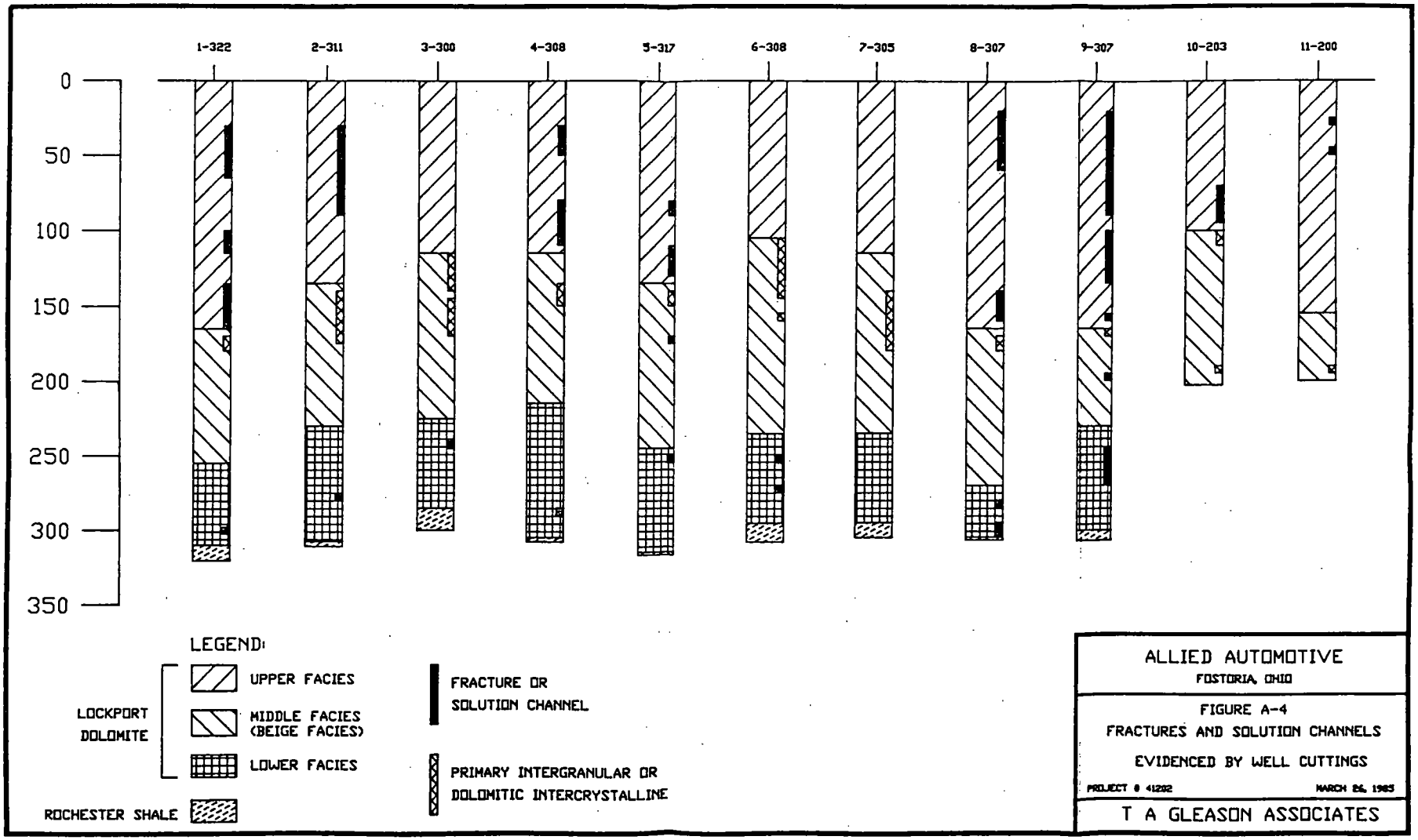
T A GLEASON ASSOCIATES

Extensive dissolution along these fracture zones has greatly enlarged and interconnected vugs and molds; commonly dissolution is so extensive that the rock has been broken into irregular clasts. In a few zones the corners and edges of the clasts are actually rounded by flowing groundwater. We conclude that these horizontal fractures and fracture zones provide virtually all of the permeability for water flow in the upper section of the Lockport Dolomite.

It must be noted that this core represents only the top 44 feet of the aquifer and is of a uniform facies. Examination of well cuttings from the deep onsite wells indicates that the dolomite changes character with depth (Figure A-4). Although variable from well to well, cuttings indicate that this upper facies is 100 to 175 feet thick under the Autolite site. Underlying this facies is a beige colored dolomite that has a varying amount of dolomitic intercrystalline or primary intergranular porosity of an estimated 5 to 10 percent. This facies may flow some groundwater, but it is not evenly distributed throughout the area. A notable exception is well M-2-311 where this beige facies has 40 feet of primary intergranular porosity; water flow measured while drilling increased sharply when this zone was penetrated. The cuttings show a bottom facies consisting of a mottled, medium- to dark-gray dolomite with minor amounts of pyrite.

Cuttings were examined for crystal linings on the faces of chips indicating fractures or solution cavities. The observed occurrence of crystal-lined chip facies varies greatly from well to well; however, this may be the result of sampling bias.

Occurrences of indicated fractures and solution channels are documented in Figure A-4.

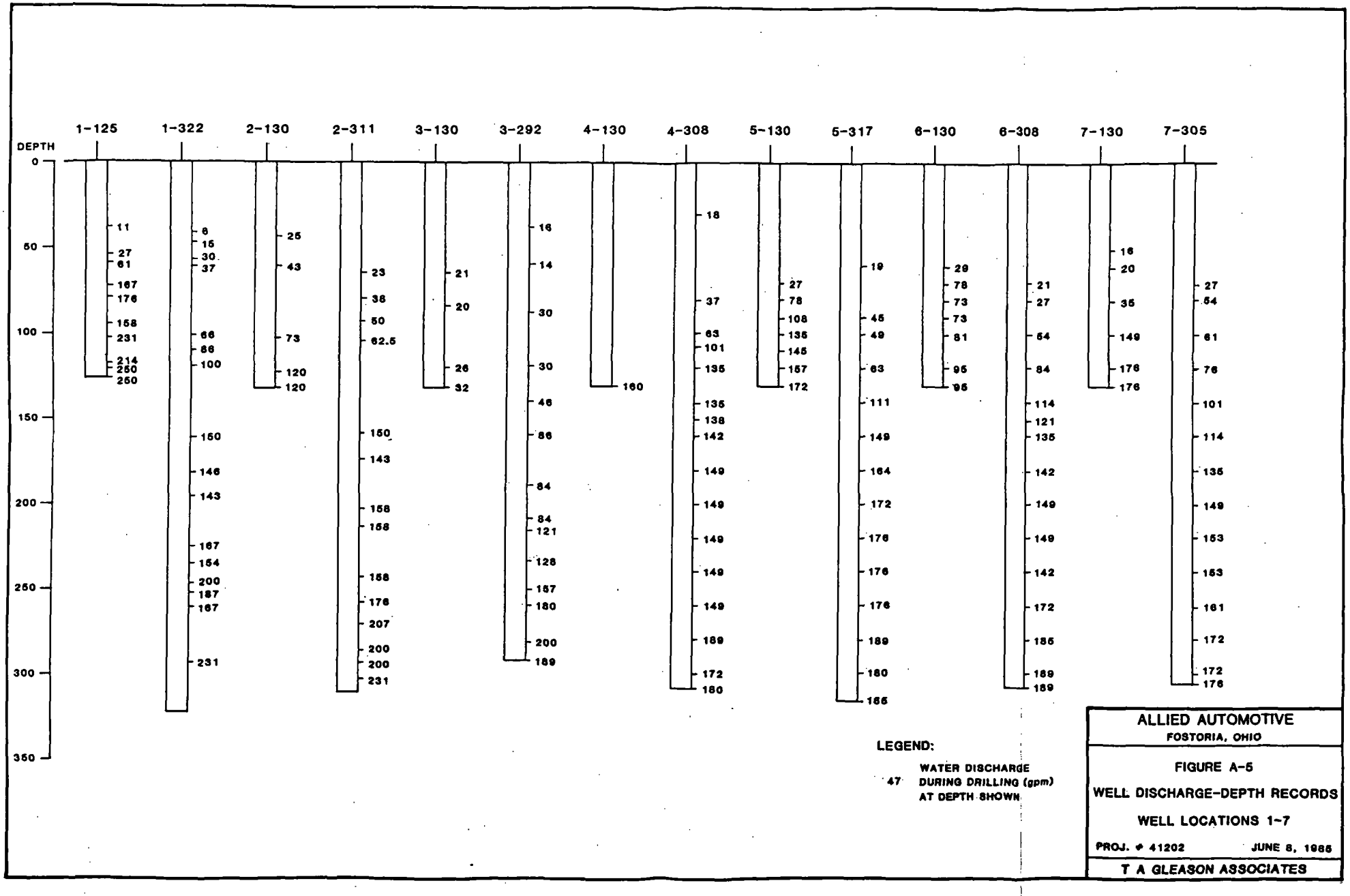

1-322
2-311
3-300
4-308
5-317
6-308
7-305
8-307
9-307
10-203
11-200
0
50
100
150
200
250
300
350
LEGEND:
LOCKPORT DOLOMITE
UPPER FACIES
MIDDLE FACIES (BEIGE FACIES)
LOWER FACIES
ROCHESTER SHALE
FRACTURE OR SOLUTION CHANNEL
PRIMARY INTERGRANULAR OR DOLOMITIC INTERCRYSTALLINE
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE A-4
FRACTURES AND SOLUTION CHANNELS
EVIDENCED BY WELL CUTTINGS
PROJECT # 41202
MARCH 26, 1985
T A GLEASON ASSOCIATES

Occurrence of fractures may be indicated by the behavior of the drill string during the drilling of each well (Figures A-5 and A-6). The drill bit suddenly dropped as much as 1 foot as it passed through a solution channel or fractured zone; in several instances the drill actually jammed tight as it encountered large fractures. A change in water color to a rust brown indicates a possible large fracture. A comparison of Figures A-4, A-5, and A-6 shows that fractures detected by drilling observations agree with the occurrence of crystal-lined chip facies; however, drilling observations failed to detect fractures everywhere crystal-lined chip facies were detected.

5.6 DISCUSSION

Interpretation of the evidence from the core, well cuttings and drill string activity indicates that these fractures in the upper zone are not laterally continuous in the same horizontal plane. It is likely that while the fractures themselves are more or less laterally continuous, the dissolution along these fractures is not sheet-like, but forms nonlinear solution channels along the fracture planes. The heavily altered fracture zones observed in the core may grade laterally into simple horizontal fractures; conversely, the simple horizontal fractures observed in the core may be heavily altered by dissolution elsewhere.

The middle section of the Lockport Dolomite consists of the beige facies previous described. This beige facies has good development of dolomitic intercrystalline porosity with minor intergranular porosity in wells 1-322, 2-311, 3-300 and 6-308. In each of these wells, water yields increased significantly during the drilling of this interval. These wells are located on the eastern side of the site.



LEGEND:

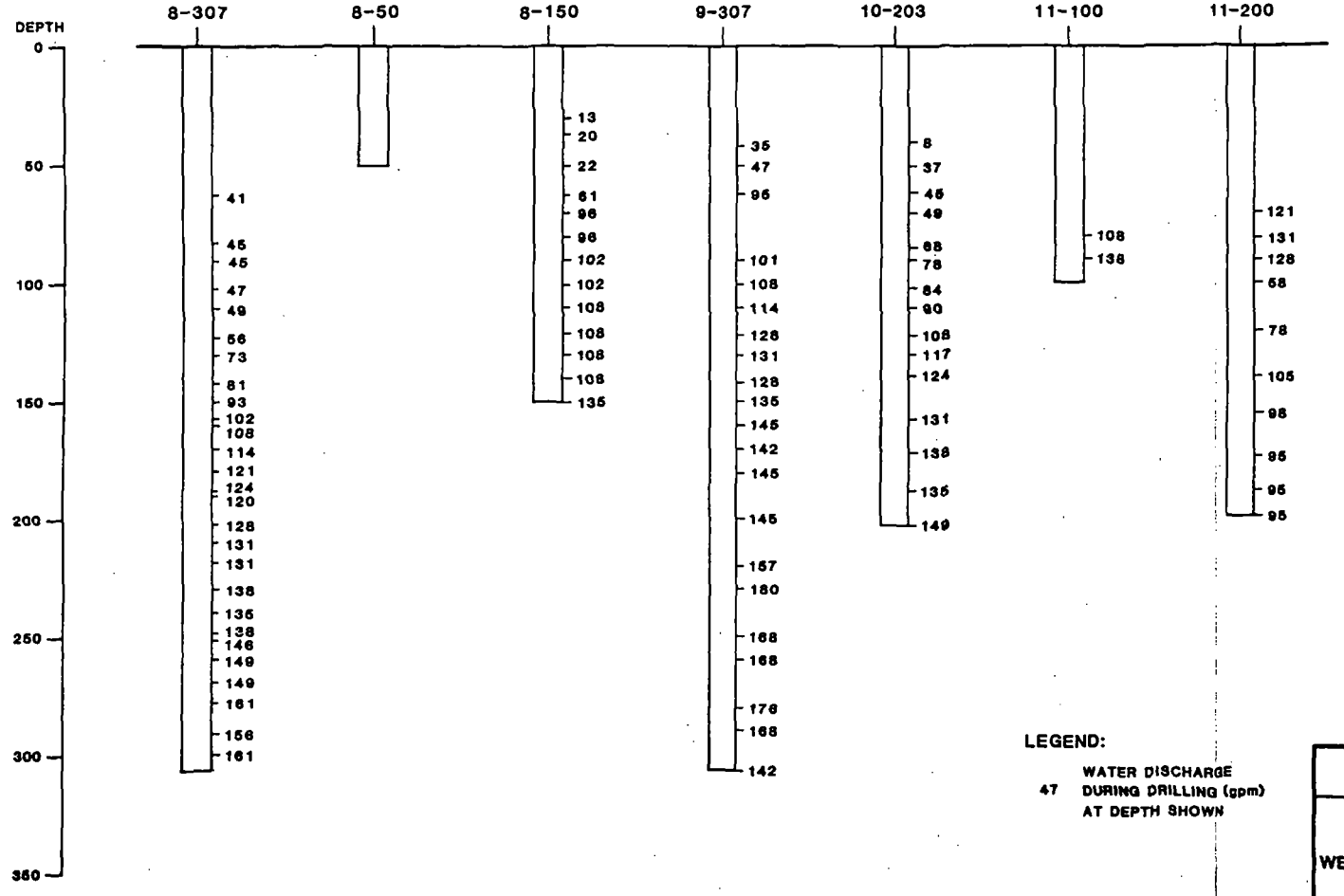
47 WATER DISCHARGE DURING DRILLING (gpm) AT DEPTH SHOWN

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-5
WELL DISCHARGE-DEPTH RECORDS
WELL LOCATIONS 1-7

PROJ. # 41202 JUNE 8, 1988

T A GLEASON ASSOCIATES



ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-6

WELL DISCHARGE-DEPTH RECORDS

WELL LOCATIONS 8-11

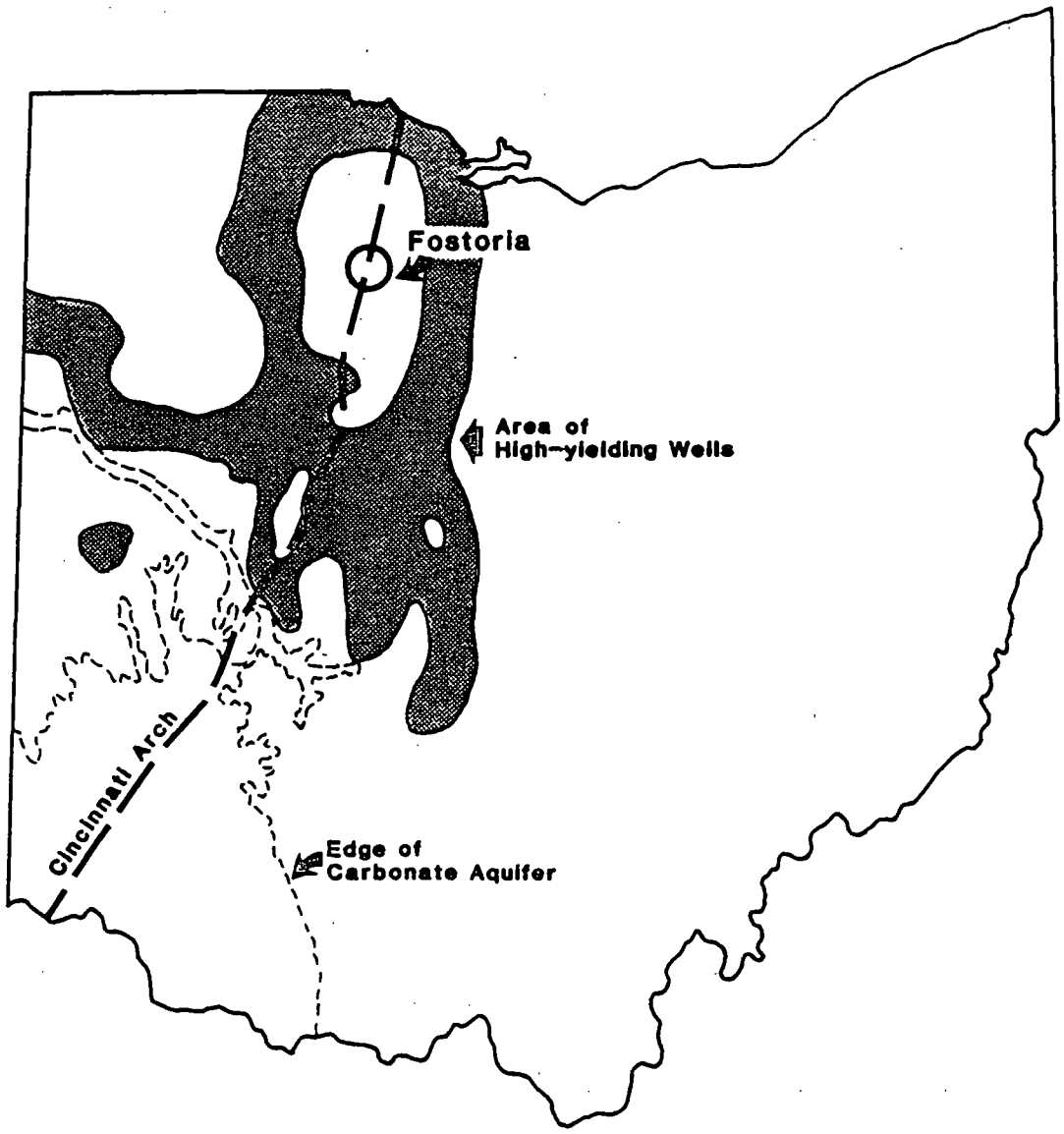
PROJ. # 41202 JUNE 8, 1985

T A GLEASON ASSOCIATES

Evidence of solution enlarged fractures is scarce below the middle section. This interval was not cored, and no drill string drops or sticking of the bit occurred during the drilling of this section. Cuttings were very carefully examined over intervals that showed sharply increased water yield in the lower section. In most cases, scanty evidence was found that indicated water flow, usually a few chips with crystal-lined faces. The abundance of these chips is much less than in the upper section.

The lower section was isolated in well 9-307 by gravel packing from 200 to 307 feet and grouting the annulus above the gravel. Subsequently only 15 gpm could be pumped from this lower section, indicating low porosity and few fractures. The middle zone was then pumped at 42 gpm, near pump capacity. We concluded from this data that the lower 100 feet of the Lockport dolomite does not generally have the porosity and permeability to yield significant amounts of water.

As mentioned elsewhere in this report, it is uncertain whether the upper section of bedrock under the Allied site is Lockport Dolomite or Greenfield Dolomite that was not eroded from the crest of the Findlay arch. Norris and Fidler (1971) delineated an area of "high-yield" wells (specific capacities greater than 5 gpm/ft) that covers the flanks, but not the crest, of the Findlay arch (Figure A-7). The porosity in this high-yield area was interpreted to be the result of groundwater solution during emergence of the Findlay arch. Erosion removed much of this aquifer from the crest of the arch, leaving the flanks of the arch relatively unaffected. When this study was extended



ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-7

HIGH-YIELDING WELLS IN

THE CARBONATE-ROCK AQUIFER

PROJ. # 41202 MAY 28, 1985

T A GLEASON ASSOCIATES

to southwestern Ohio (Norris and Fidler, 1973), a discreet porous zone was discovered at the base of the Greenfield Dolomite. This zone, named the Newburg Zone, can be correlated to a gas-producing zone in eastern Ohio and may be continuous across the state. Norris and Fidler feel that this zone may extend into northwestern Ohio as a discreet water-yielding stratum.

SUBMERSIBLE PUMP RECORD

CUSTOMER Bendix Autolite Corporation

ADDRESS North Union Street - Fostoria, Ohio 44830

JOB NAME Same

LOCATION Boiler house

WELL NO. 1 WELL DIA. 6 " WELL DEPTH _____ ' STATIC LEVEL 35

PUMP SER. NO. 2403 CONDITIONS 150 GPM 302' HEAD

FIG. _____ MODEL 5CM175 Ni-Resist

UNIT NO. _____ SYSTEM NO. _____

MOTOR: 20 HP 3450 RPM 3 PHASE 60 CYCLE 460 VOLT

MFG. Franklin SER. NO. Dare K-83

MODEL 2361156410 TYPE Ni-Resist Bell Ends

THRUST BRG. _____ RADIAL BRG. _____

DROP PIPE: LENGTH 211' DIA. 3" half random MATERIAL Galv.

CABLE: LENGTH 220' SIZE 8-8-8

BOWLS: MFR. Crown MATERIAL Ni-Resist NO. STAGES 10

SIZE: 5" IMPELLER NO. (8) A Trim - (2) B-trim

AIRLINE: LENGTH 212' SIZE ½" Plastic GAUGE Ametek

WELL SEAL: MFR. Dunbar SIZE 11"x8"x3"

TYPE Weld on flanged sanitary FIG. _____

TEST RECORD

G.P.M.	PUMPING LEVEL	HEAD ABOVE	TOTAL HEAD	Max. 30.5 AMPERES	LENGTH OF TEST

REMARKS: The above pump and motor replaces 15 HP Jacuzzi Pump Serial No. 5F7-049182. New wire and check valve installed also this date.

INSTALLED BY: Pat Parsons DATE Nov. 15, 1983

HELPER: Carl Taft HELPER: _____

HELPER: _____ HELPER: _____

Well Log

Dunbar Drilling and Supply Company

DELTA, OHIO

Customer The Electric Auto-Lite

Address Fostoria, Ohio

Job Name Same (Spark Plug Division)

Location Fostoria, Ohio

Well No. B-1

Strainer: Overall Length None Dia. Ft. of Slot

Slot Size No. Fittings

Mfd. By Material

Pipe: No. Ft. 24½ Size 8 " Wt. 29 lb. Type Drive

No. Ft. Size " Wt. lb. Type

No. Ft. Size " Wt. lb. Type

Drive Shoe: Size 8 " Size " Size "

Static Water Level 14 Ft. Completed depth of well 295 ft.

Surging and Developing: Total Time Hrs.

GPM	PUMPING LEVEL	LENGTH OF TEST	TEMPERATURE
250	55 Ft.	1½ Hrs.	°F.
	Ft.	Hrs.	°F.
	Ft.	Hrs.	°F.
	Ft.	Hrs.	°F.

REMARKS: 3½' to rock 10" hole drilled to 23½'. Pipe 1' above ground

Date Started November 2, 1951 Date Completed November 25, 1951

DRILLER	HELPER	HELPER
Elgon Parsons	Neil Whitmer	

ELECTRIC AUTO-LITE CO.

Well Log

From	To	Formation
0'	3½'	Top soil and clay
3½'	20'	Shaly gray limestone
20'	73'	Buff limestone (hard)
73'	75'	Soft layer (water)
75'	95'	Hard buff limestone
95'	165'	Hard white limestone
165'	170'	Soft layer (water)
170'	205'	Hard white limestone
205'	267'	Gray limestone
267'	295'	Hard gray limestone

REMARKS:

Well Log

Dunbar Drilling and Supply Company

DELTA, OHIO

Customer The Electric-Auto-Lite Company

Address Fostoria, Ohio

Job Name Spark Plug Division

Location North Union Street - Fostoria, Ohio

Well No. B-2

Strainer: Overall Length None Dia. _____ Ft. of Slot _____

Slot Size No. _____ Fittings _____

Mfd. By _____ Material _____

Pipe: No. Ft. 56 Size 10 " Wt. 34.24 lb. Type S.D. (a)

No. Ft. _____ Size _____ " Wt. _____ lb. Type _____

No. Ft. _____ Size _____ " Wt. _____ lb. Type _____

Drive Shoe: Size none " Size _____ " Size _____ "

Static Water Level 12 Ft. Completed depth of well 300 ft.

Surging and Developing: Total Time _____ Hrs.

GPM	PUMPING LEVEL	LENGTH OF TEST	TEMPERATURE
250	30 Ft.	1½ Hrs.	_____ °F.
440	52 Ft.	½ Hrs.	_____ °F.
150	22 Ft.	½ Hrs.	_____ °F.
_____	_____ Ft.	_____ Hrs.	_____ °F.

REMARKS: (a) Casing is cemented in.

Date Started December 27, 1952 Date Completed February 4, 1953

DRILLER	HELPER	HELPER
Ralph Drummond	Maurice Weaks	_____

ELECTRIC AUTO LITE CO.

Well Log

From	To	Formation
0'	3½'	Clay
3½'	70'	Cream color limestone
70'	90'	Cream & gray limestone
90'	120'	Brown & gray limestone
120'	160'	Brown & white limestone
160'	185'	White & brown limestone
185'	220'	Yellow & gray limestone
220'	245'	White & gray limestone
245'	255'	Yellow limestone
255'	276'	Gray little white limestone
276'	290'	Gray brown limestone
290'	300'	Dark gray & brown limestone

REMARKS:

DUNBAR DRILLING, INC.

SUBMERSIBLE PUMP RECORD

CUSTOMER Bendix Autolite Corporation

ADDRESS North Union Street - Fostoria, OH 44830

JOB NAME Same

LOCATION

WELL NO. 1 WELL DIA. 6 " WELL DEPTH ' STATIC LEVEL 15

PUMP SER. NO. SE7-049182 CONDITIONS 147 GPM 300' HEAD

FIG. MODEL 15S6M6-S

UNIT NO. SYSTEM NO.

MOTOR: 15 HP 3450 RPM 3 PHASE 60 CYCLE 460 VOLT

MFG. Franklin SER. NO.

MODEL 2361149004 TYPE Date Code G-79

THRUST BRG. RADIAL BRG.

DROP PIPE: LENGTH 211' DIA. 3"(half random) MATERIAL Galv.

CABLE: LENGTH 220' SIZE 12-12-12

BOWLS: MFR. Jacuzzi MATERIAL Std. NO. STAGES 6

SIZE: 6" IMPELLER NO.

AIRLINE: LENGTH 212' SIZE ½" Plastic GAUGE Ametek

WELL SEAL: MFR. Dunbar SIZE 11 x8 x3"

TYPE Weld on FIG.

TEST RECORD 23.3

G.P.M.	PUMPING LEVEL	HEAD ABOVE	TOTAL HEAD	AMPERES	LENGTH OF TEST

REMARKS: (a) New motor, wire and airline this date.

INSTALLED BY: Pat Parsons DATE Dec. 16, 1981 (a)

HELPER: Craig Parker HELPER:

HELPER: HELPER:

DUNBAR DRILLING. INC.

TURBINE PUMP RECORD

CUSTOMER Bendix Autolite Corp. DATE INSTALLED Sept. 21, 19

ADDRESS P.O. Box 880 - Fostoria, Ohio

JOB NAME Same

LOCATION

WELL NO. 2 WELL DIA. 10 " WELL DEPTH 301 ' STATIC LEVEL 28

PUMP SER. NO. T-76099 (a) CONDITIONS 260 GPM 260' HE

MOTOR: 25 HP 1765 RPM 3 PHASE 60 CYCLE 440 VO

MFR. G.E. SER. NO. PHJ6918712 TYPE K

MODEL 25K6512XA2A FRAME 6512 DR. CPLG. BORE 1-3/1

THRUST BRG. 7313 BDF RADIAL BRG. 212KD Fafnir

GEAR DRIVE: SIZE RATIO TO MFR.

SER. NO. DRIVE COUPLING BORE

BELT DRIVE: MODEL PUL. DIA. MFR.

SER. NO. DRIVE COUPLING BORE

HEAD: MFR. Peerless SIZE 12C ST. BOX DIA. 1-3/1

COLUMN: LENGTH 150' DIA. 5" MATERIAL Std. Deming

LINESHAFT: LENGTH 150' DIA. 1" MATERIAL Std. Sleeve De

BEARING CENTERS 10 FEET.

BOWLS: MFR. Deming MATERIAL Std. NO. STAGES 10

SIZE 8" IMPELLER NO. 27010

SUCTION PIPE: LENGTH 10' DIA. 5" MATERIAL Std.

STRAINER: SIZE 5" TYPE Keystone Galv.

AIRLINE: LENGTH 150' SIZE ¼" Plastic GAUGE

TEST RECORD

G. P. M.	PUMPING LEVEL	HEAD ASOVE	TOTAL HEAD	IMPELLER ADJUSTM.	AMPERES	LENGT: TES

REMARKS: (a) replaces old Peerless Pump Serial No. 103813.

INSTALLED BY: Pat Parsons

HELPER: Fred Krauss HELPER:

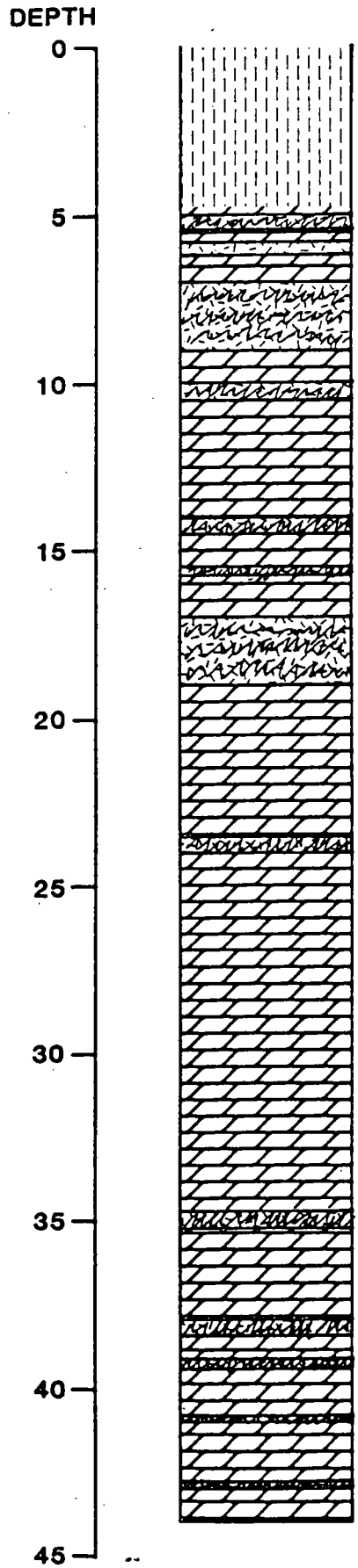
SPECIFICATION DATA

	MOTOR SHAFT	BELT HEAD SHAFT	GEAR HEAD SHAFT	COMBINATION DRIVE SHAFT
SIZE	1-3/16"			
LENGTH	28-1/4"			
TOP THREAD	5½" x Box T.			
KEYWAY	10"			
CENTER KEYWAY	5/16"			
BOTTOM THREAD	10TLHx2"			
MATERIAL				

	TOP		INTERMEDIATE		BOTTOM	
	COLUMN	SHAFT	COLUMN	SHAFT	COLUMN	SHAFT
SIZE	5"	1-3/16x1"	5"	1"	5"	1"
LENGTH	59½"	65-5/8"	91-11½"	10[illegible]-0"	59½"	60"
TOP THREAD	8RHx2"	10TLHx2	8RHx2	14TLHx1-5/8	8RHx2	14TLHx1-5
BOTTOM THREAD	"	14TLHx1-5/8 "	"	"	"	"
MATERIAL	Std.	410 S.S.	Std.	Std.	Std.	Std.

POWER UNIT		FLEXIBLE DRIVE SHAFT		FLANGES
MAKE		MAKE		
MODEL		SIZE		
SERIAL NO.		BORE ENGINE		
P.T.O. SHAFT DIA.		BORE GEAR		

REMARKS:



Brown clayey silt, minor sand

Fracture/solution channel zone.
Brown clay in vugs.

Single horizontal fractures spaced 3" apart.
Some fracture faces crystal-lined.
1"-2" vugs along fractures.

Iron stained fracture faces, rounded clasts in fracture zone.

Fracture/solution channel zone, loose friable pieces, iron stained, some crystal coated rock faces.

Single horizontal fractures spaced 2"-6" apart, minor short vertical fractures, 1"-2" vugs associated with fractures.

Fracture /solution channel zone.

Single horizontal fractures spaced 2"-8" apart, some iron stained, some crystal coated 2" irregular solution cavities associated with fractures.

Fracture/solution channel zone, loose rounded clasts.

LEGEND:

- CLAYEY SILT
- FRACTURE/SOLUTION CHANNEL ZONE
- DOLOMITE

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-9

TEST BORING 1

CORE LOG

PROJ. # 41202 MAY 17, 1985

T A GLEASON ASSOCIATES

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB - 2	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive — PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-9-84

DATE FINISH 10-9-84

TAG REP. C. Coe

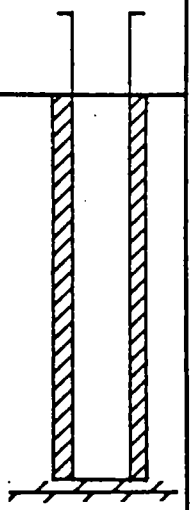
GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
2					Limestone fill	Hole advanced with hollow-stem auger, samples were taken with 2" split spoon sampler.
		1				
4	Ss				Brown sand, fill	
					Limestone fill	
6	Ss	2	100/4"			Bottom of hole, 6.5'
					Dolomite	

SURFACE ELEVATION



Well Completion: 4" PVC Blank set at Dolomite/limestone fill interface. Seal from interface to surface with Bentonite-cement grout.

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-10

Approved for publication _____ by _____

Form L

TA GLEASON ASSOCIATES Environmental and Geotechnical Services	TEST BORING LOG	No.	SHEET	OF
		TB-3	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-9-84

DATE FINISH 10-9-84

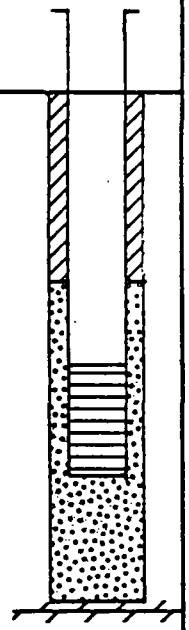
TAG REP. C. Coe

GROUNDWATER LEVELS			
REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
					Asphalt Paving	
2	Auger	1			Brown sand, Little silt and clay fill	Hole advanced with 6" hollow stem auger, and samples were taken with 2" split spoon sampler.
4						
6	Auger	2			Light brown weathered dolomite aggragate	
8						Total depth 8'

SURFACE ELEVATION



Well Completion: 1 1/2" Dia. PVC casing set at 4.3'.
2" Dia. 0.01 slot PVC screen.
Annulus sealed with Bentonite-cement grout.

Approved for publication _____ by _____

Form L

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-11

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB-4	1	1

PROJECT Fostoria, Groundwater Investigations
CLIENT Allied Automotive PROJECT No. 40601
DRILLING CONTR. H.C. Nutting
DATE START 10-9-84
DATE FINISH 10-9-84
TAG REP. C. Coe

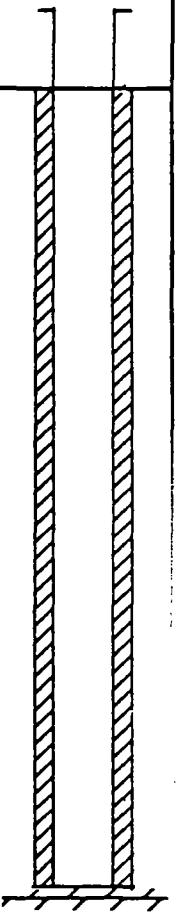
GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
2					Fill, Brown silt, some clay, Little sand	Hole advanced with 6" hollow-stem auger, and samples were taken with 2" split spoon sampler.
4	Ss	1				
6	Ss	2			Limestone fill	
8	Ss	3				
10	Ss	4				
12					Dolomite	Bottom of hole, 12.5'.

SURFACE ELEVATION



Well completion: 4" PVC blank set at Dolomite/limestone fill interface.
Seal from interface to surface with Bentonite-cement grout.

Approved for publication by

Form L 8

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART

FIGURE A-12

TA GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB-5	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive — PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-10-84

DATE FINISH 10-10-84

TAG REP. C. Coe

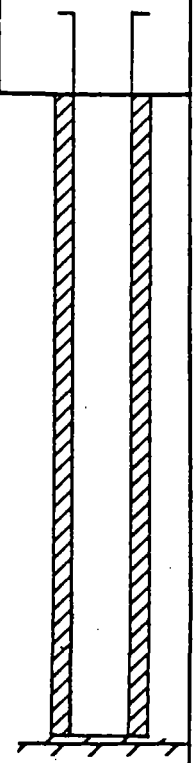
GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
					Concrete	Hole advanced with 6" hollow stem auger, and samples were taken with 2" split spoon sampler.
2					Fill, Brown silt, Little sand and clay	
		1				
4	Ss					
6	Ss	2				
8	Ss	3			Limestone fill	
		3A				
10	Ss				Dolomite	Bottom of hole, 10.0'

SURFACE ELEVATION



Well Completion: 4" PVC blank set at Dolomite/limestone fill interface. Seal from interface to surface with Bentonite-cement grout.

Approved for publication ____ by ____

Form L 8

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-13

T.A. GLEASON ASSOCIATES Environmental and Geotechnical Services	TEST BORING LOG	No.	SHEET	OF
		TB-6	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-10-84

DATE FINISH 10-10-84

TAG REP. C. Coe

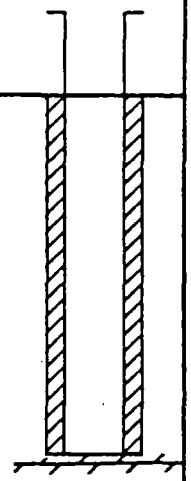
GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
2				SM	Till, Brown sand, some silt Little clay	Hole advanced with 6" hollow stem auger, and samples were taken with 2" split spoon sampler.
4		1				
		2			Weathered dolomite	Bottom of hole, 5.5'
					Dolomite	

SURFACE ELEVATION



Well Completion: 4" PVC blank set at Dolomite/limestone fill interface. Seal from interface to surface with Bentonite-cement grout.

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-14

Approved for publication _____ by _____

Form L 8

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB-7	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive — PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-10-84

DATE FINISH 10-10-84

TAG REP. C. Coe

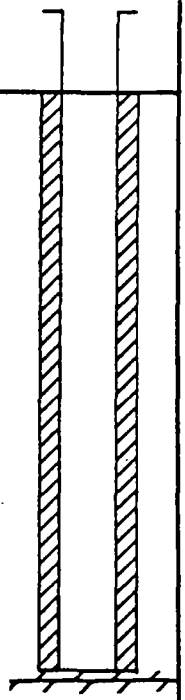
GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
	Ss	1		ML	Dark gray clay	Hole advanced with 6" hollow stem auger, and samples were taken with 2" split spoon sampler.
2						
		2			Mottled gray to rust clay, little silt, trace of sand and gravel	
4	Ss					
	Ss	3				
6						
					Dark gray clay, little silt, trace of sand and gravel	
8	Ss	4				
					Dolomite	Bottom of hole, 9'

SURFACE ELEVATION



Well completion: 4" PVC blank set at Dolomite/limestone fill interface. Seal from interface to surface with Bentonite-cement grout.

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-15

Approved for publication by

Form L 87

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB-7A	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive — PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-10-84

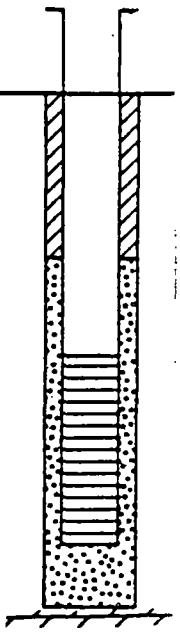
DATE FINISH 10-10-84

TAG REP. C. Coe

GROUNDWATER LEVELS

REMARKS	DATE	TIME	DEPTH

Completion Diagram



DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
2					Till, clay, little silt, trace of sand and gravel	Hole advanced with 6" hollow stem auger, and samples were taken with 2" split spoon sampler.
4	Ss	1				
6	Ss	2				
8					Dolomite	Bottom of hole, 8.2'

SURFACE ELEVATION

Well Completion: 1 1/2" Dia. PVC casing set at 4.3'.
2" Dia. 0.01 slot PVC screen.
Annulus sealed with Bentonite-cement grout.

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-16

Approved for publication _____ by _____

Form L 8

TA GLEASON ASSOCIATES Environmental and Geotechnical Services	TEST BORING LOG	No.	SHEET	OF
		TB-8	1	1

PROJECT Fostoria, Groundwater Investigations

CLIENT Allied Automotive PROJECT No. 40601

DRILLING CONTR. H.C. Nutting

DATE START 10-10-84

DATE FINISH 10-10-84

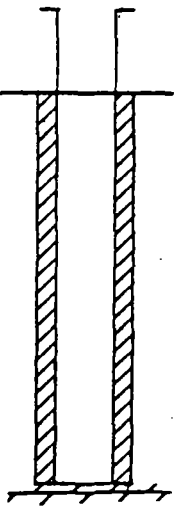
TAG REP. C. Coe

GROUNDWATER LEVELS			
REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
	Ss	1		ML	Dark gray silt, little sand, trace of gravel	Hole advanced with hollow stem auger, and samples were taken with 2" split spoon sampler.
2				ML	Brown silt, little sand and clay	
	Ss	2				
4						
	Ss	3		SM	Dark gray sand, little silt and clay	
6					Dolomite	Bottom of hole, 6.1'

SURFACE ELEVATION



Well Completion: 4" PVC blank set at Dolomite/limestone fill interface Seal from interface to surface with Bentonite-cement grout.

Approved for publication _____ by _____

Form L 8

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-17

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TEST BORING LOG

No.	SHEET	OF
TB-1	1	2

PROJECT: Fosoria, Groundwater Investigations

CLIENT: Allied Automotive — PROJECT No. 40601

DRILLING CONTR.: H.C. Nutting

DATE START:

DATE FINISH:

TAG REP.:

GROUNDWATER LEVELS			
REMARKS	DATE	TIME	DEPTH

Completion Diagram

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	SYMBOL	DESCRIPTION	REMARKS
					Brown silt, little sand, and clay	Auger refusal @5'
	Ss	1				1 7/8" NX core from 5' to 44'
		C1			Lockport Dolomite (For Description, see Core Log)	
10		C2				
		C3				
20		C4				
		C5				
30		C6				
		C7				
40		C8				Total Depth, 44'

SURFACE ELEVATION

Soil log

Dolomite log

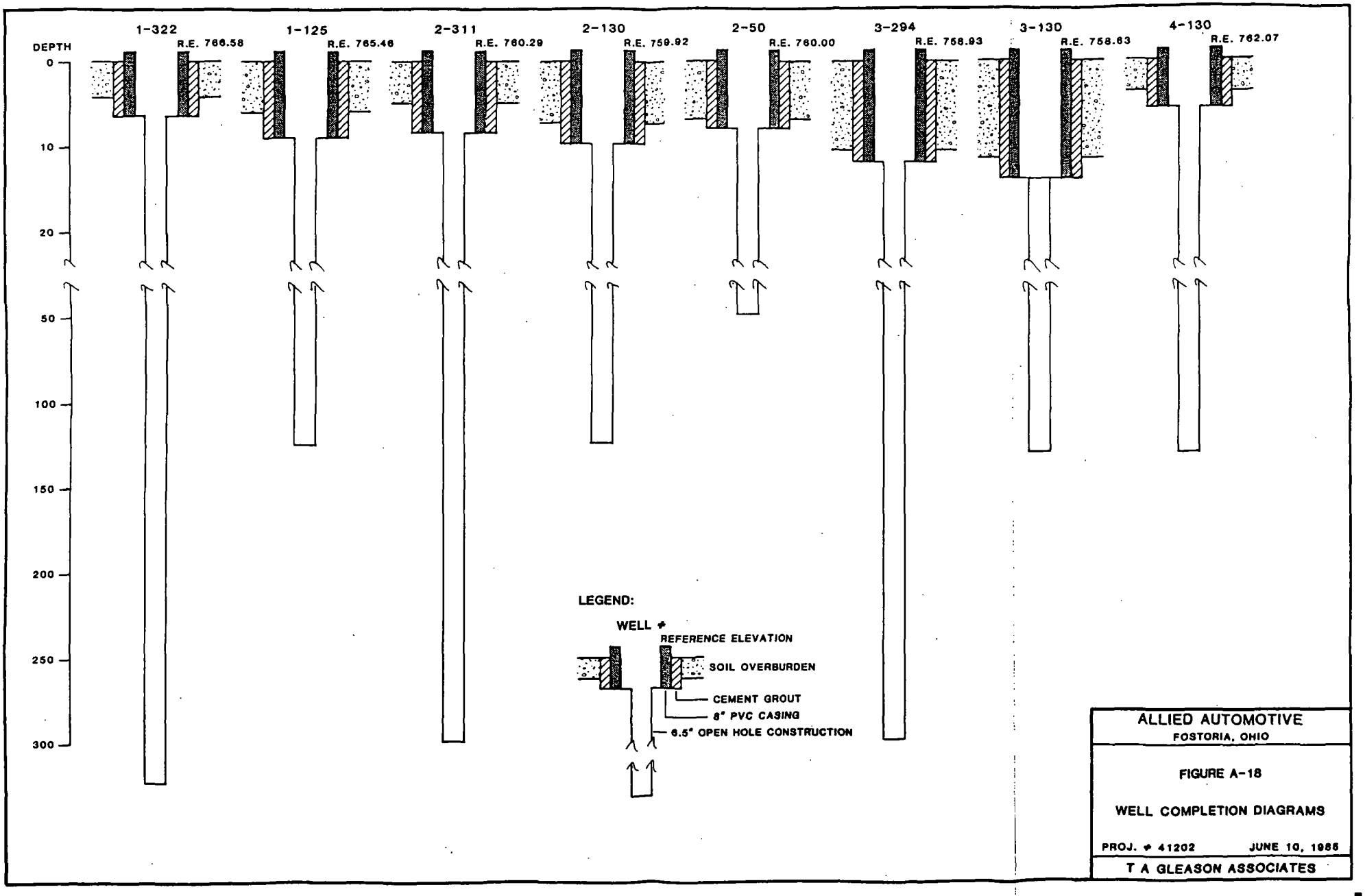
Well Completion: 4" Dia. PVC casing set at 5' depth.
Annulus sealed with Bentonite-cement grout.

Approved for publication ____ by ____

Form L

FOR INTERPRETATION OF SOIL, ROCK AND GROUNDWATER CONDITIONS, SEE TEXT OF REPORT, OF WHICH THIS LOG IS A PART.

FIGURE A-8



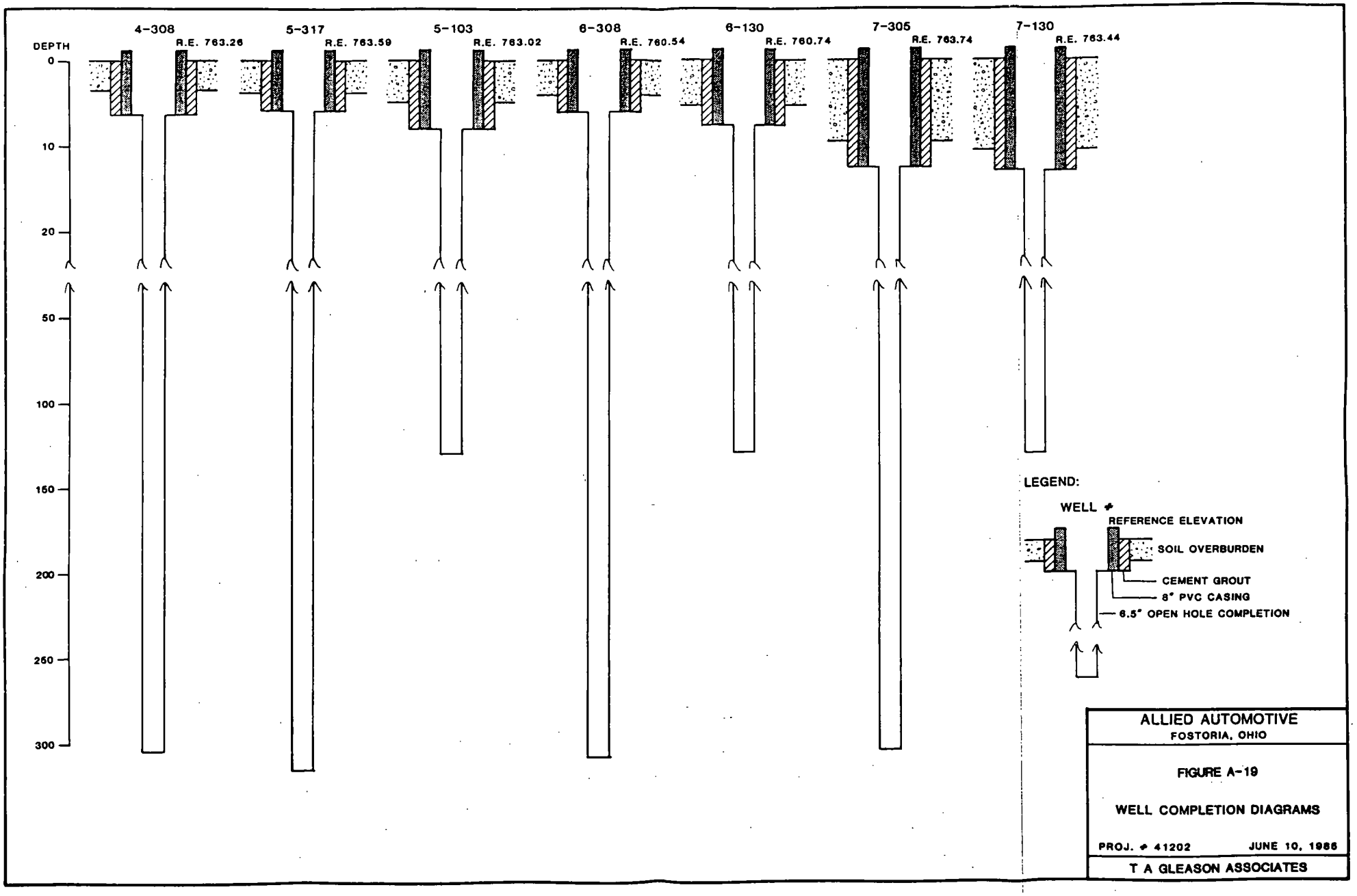
ALLIED AUTOMOTIVE
FOSTORIA, OHIO

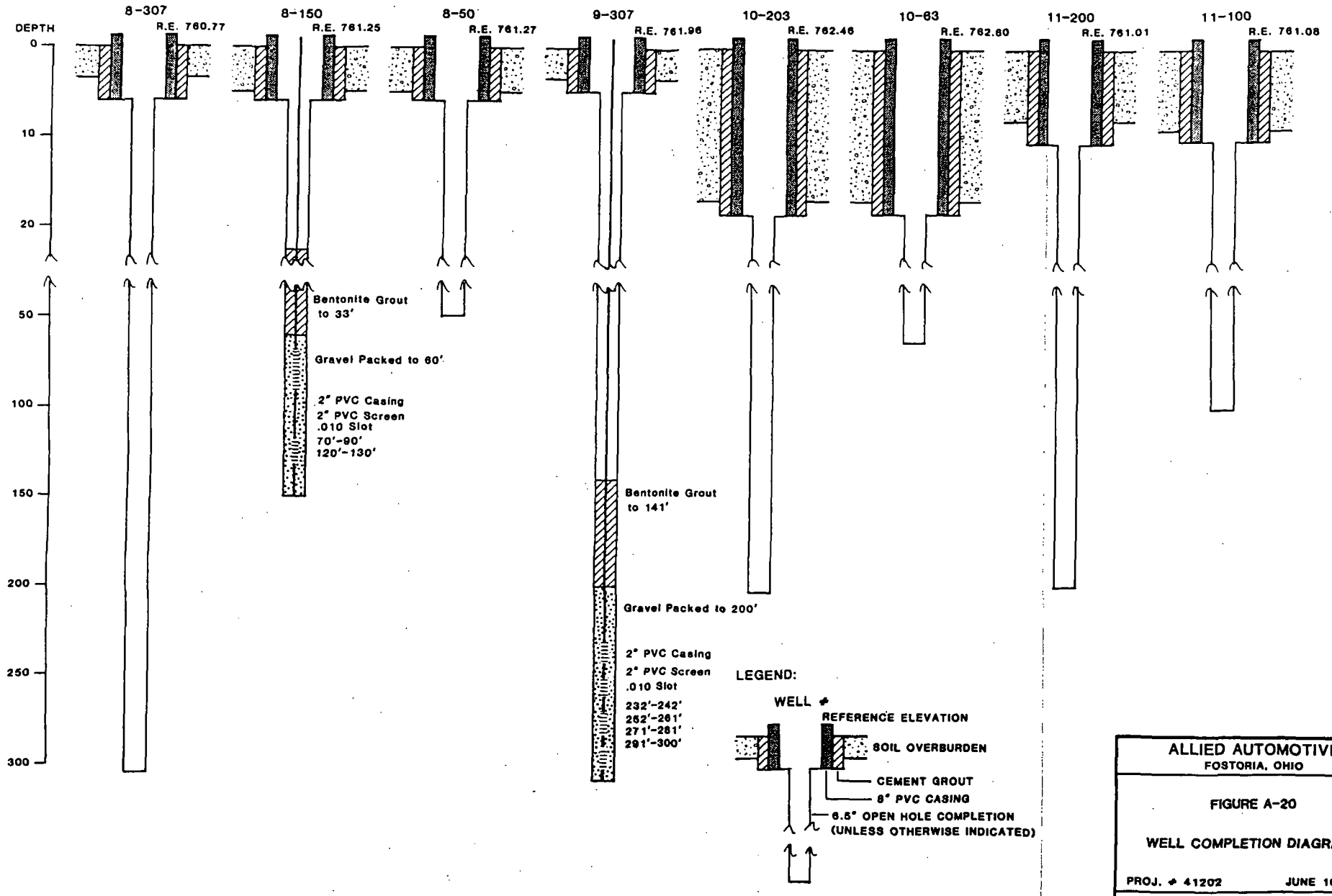
FIGURE A-18

WELL COMPLETION DIAGRAMS

PROJ. # 41202 JUNE 10, 1986

T A GLEASON ASSOCIATES


DEPTH
0
10
20
50
100
150
200
250
300
4-308
R.E. 763.26
5-317
R.E. 763.59
5-103
R.E. 763.02
6-308
R.E. 760.54
6-130
R.E. 760.74
7-305
R.E. 763.74
7-130
R.E. 763.44
LEGEND:
WELL #
REFERENCE ELEVATION
SOIL OVERBURDEN
CEMENT GROUT
8" PVC CASING
6.5" OPEN HOLE COMPLETION
ALLIED AUTOMOTIVE
FOSTORIA, OHIO
FIGURE A-19
WELL COMPLETION DIAGRAMS
PROJ. # 41202
JUNE 10, 1986
T A GLEASON ASSOCIATES



ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-20

WELL COMPLETION DIAGRAMS

PROJ. # 41202 JUNE 10, 1986

T A GLEASON ASSOCIATES

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Onsite wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
1-322	766.58	11-2-84	1015	24.25	742.33	
1-125	765.46	11-2-84	1016	22.39	743.07	
2-311	760.29	11-2-84	1022	15.96	744.33	
2-130	759.92	11-2-84	1024	15.42	744.50	
3-294	758.93	11-2-84	1057	10.88	748.05	
3-130	758.63	11-2-84	1055	11.20	747.43	
4-308	763.26	11-2-84	1050	16.00	747.26	
4-130	762.07	11-2-84	1052	14.85	747.22	
5-317	763.59	11-2-84	1005	26.07	737.52	
5-130	763.02	11-2-84	1006	25.24	737.78	
6-308	760.54	11-2-84	1028	17.10	743.44	
6-130	760.74	11-2-84	1029	17.35	743.39	
7-305	763.26	11-2-84	1043	20.75	742.51	
7-130	763.44	11-2-84	1042	20.30	743.14	
B-2	762.53	11-2-84	1011	44.42	718.11	PUMPING
B-1	761.94	11-2-84	1000	69.55	692.39	PUMPING
TB-1	761.97	11-2-84	1033	19.20	742.77	
QUARRY	754.91	11-2-84	1104	6.40	748.51	

CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT: Onsite Wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL I.D.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
1-322	766.58	11-10-84	1351	22.74	743.84	
1-125	765.46	11-10-84	1354	21.39	744.07	
2-311	760.29	11-10-84	1359	14.72	745.57	
2-130	759.92	11-10-84	1404	14.46	745.46	
3-294	758.93	11-10-84	1422	10.85	748.08	
3-130	758.63	11-10-84	1420	10.58	748.05	
4-308	763.26	11-10-84	1428	15.84	747.42	
4-130	762.07	11-10-84	1435	14.60	747.47	
5-317	763.59	11-10-84	1332	21.67	741.92	
5-130	763.02	11-10-84	1328	21.38	741.64	
6-308	760.54	11-10-84	1412	15.53	745.01	
6-130	760.74	11-10-84	1415	15.98	744.76	
7-305	763.26	11-10-84	1443	19.12	744.14	
7-130	763.44	11-10-84	1439	18.78	744.66	
B-2	762.53	11-10-84	1347	21.57	740.96	
B-1	761.94	11-10-84	1340	18.95	742.99	
TB-1	761.97	11-10-84	1449	17.43	744.54	

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Onsite Wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
1-322	766.58	11-11-84	2132	21.57	745.01	
1-125	765.46	11-11-84	2133	20.20	745.26	
2-311	760.29	11-11-84	2146	14.59	745.70	
2-130	759.92	11-11-84	2145	14.25	745.67	
4-308	763.26	11-11-84	2214	15.80	747.47	
4-130	762.07	11-11-84	2215	14.55	747.52	
5-317	763.59	11-11-84	2124	20.22	743.37	
5-130	763.02	11-11-84	2123	19.71	743.31	
6-308	760.54	11-11-84	2150	15.32	745.22	
6-130	760.74	11-11-84	2151	15.61	745.13	
7-305	763.26	11-11-84	2224	18.90	744.36	
7-130	763.44	11-11-84	2224	18.48	744.96	
B-2	762.53	11-11-84	2118	19.05	743.48	
B-1	761.94	11-11-84	2125	18.08	743.86	
TB-1	761.97	11-11-84	2154	17.01	744.96	

CHKD. BY ____ DATE ____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Residential Wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
R-3	761.71	12-17-84	P.M.	13.14	748.25	
		1-28-85	1634	12.58	749.13	
R-16	756.25	12-17-84	P.M.	6.30	749.95	
		1-29-85	1638	5.72	750.53	
		1-31-85	1717	5.80	750.45	
R-27	762.75	12-17-84	P.M.	14.50	748.25	
R-32	762.88	1-31-85	1002	12.98	749.90	
R-44 NW	757.71	1-31-85	0934	7.61	750.10	
R-44 SE	758.57	1-31-85	1214	8.52	750.05	
R-58	765.38	1-30-85	1343	24.11	741.27	
R-60	760.41	12-17-84	P.M.	11.85	748.36	
R-65	757.58	12-17-84	P.M.	7.76	749.82	
		1-31-85	1704	7.69	749.89	
R-72	755.09	12-17-84	1300	6.85	748.24	
		1-31-85	1712	5.24	749.85	
R-75	758.05	12-18-84	1542	6.82	751.23	
R-87	756.28	12-18-84	1555	8.28	748.00	
R-92	761.08	12-18-84	1517	12.44	748.64	
R-103	758.85	12-27-84	1640	6.64	752.21	
R-104	768.73	12-27-84	1615	13.67	755.06	
R-107	770.35	12-13-84	0920	20.76	749.59	
		12-19-84	1135	20.73	749.62	
		1-28-85	1614	20.29	750.06	
R-109	775.03	12-14-84		21.04	753.99	
R-110	772.23	12-19-84	1140	17.90	754.33	
		1-28-85	1547	16.71	755.52	
R-111	771.41	12-13-84	1140	16.95	754.46	
		12-19-84	1010	16.88	754.53	
		1-28-85	1544	15.81	755.60	
R-112	777.20	12-13-84	0900	23.07	754.13	
		12-19-84	1049	22.70	754.50	
		1-29-84	1516	22.95	754.25	

CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Residential Wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
R-113	769.48	12-14-84	1350	14.20	755.28	
		12-27-84	1601	13.86	755.62	
R-114	769.96	12-14-84	1400	20.72	749.24	
		12-19-84	1038	19.21	750.75	
		1-28-85	1557	18.46	751.50	
R-115	763.50	2-1-85	0945	17.63	745.87	
R-116	754.02	1-31-85	1055	6.96	747.06	
		2-1-85	0952	7.18	746.84	
R-117	754.02	12-18-84	1558	8.08	745.94	
R-118	762.99	12-28-84	1430	17.47	745.52	
		1-29-85	1439	19.68	743.31	
		12-27-84	1544	17.53	745.46	
R-119	767.83	12-14-84	1250	23.06	744.77	
		12-19-84	1250	23.02	744.81	
		1-29-85	1523	24.27	743.56	
		12-28-85	1440	22.18	745.65	
R-120	763.67	12-14-84	1440	17.17	746.50	
		1-30-85	1358	16.40	747.27	

CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Commercial & Industrial Wells PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
C-2	761.20	12-28-84	1410	13.33	747.87	
		1-31-85	1740	14.25	746.95	
C-3	764.59	12-11-84	1654	15.40	749.19	
C-4	763.49	12-11-84	1402	22.08	741.41	
C-9	755.72	12-18-84	1530	6.98	748.74	
C-10	760.35	12-28-84	1211	28.34	732.01	
C-17	772.69	12-13-84	1620	49.75	722.94	
		12-28-84	1315	48.76	723.93	
		1-28-85	1434	39.93	732.76	
		1-30-85	1432	39.61	733.08	
C-18	766.97	12-14-84	1620	38.34	728.63	
		12-19-84	0844	45.65	721.29	
		12-28-84	1150	44.68	722.29	
		1-29-85	1442	35.84	731.13	
		1-30-85	1441	35.58	731.39	
		1-31-85	1649	34.79	732.18	
C-19	781.63	12-13-84	1600	124.60	657.03	PUMPING
		12-28-84	1144	75.15	706.18	
		1-28-85	1450	58.54	723.09	
		1-30-85	1450	58.14	723.49	
		1-31-85	1642	57.96	723.87	
C-23	780.05	12-13-84	1515	16.13	766.92	
C-24	765.76	12-13-84	1444	8.43	757.33	
C-25	766.30	12-13-84	1427	9.70	756.60	

CHKD. BY _____ DATE _____

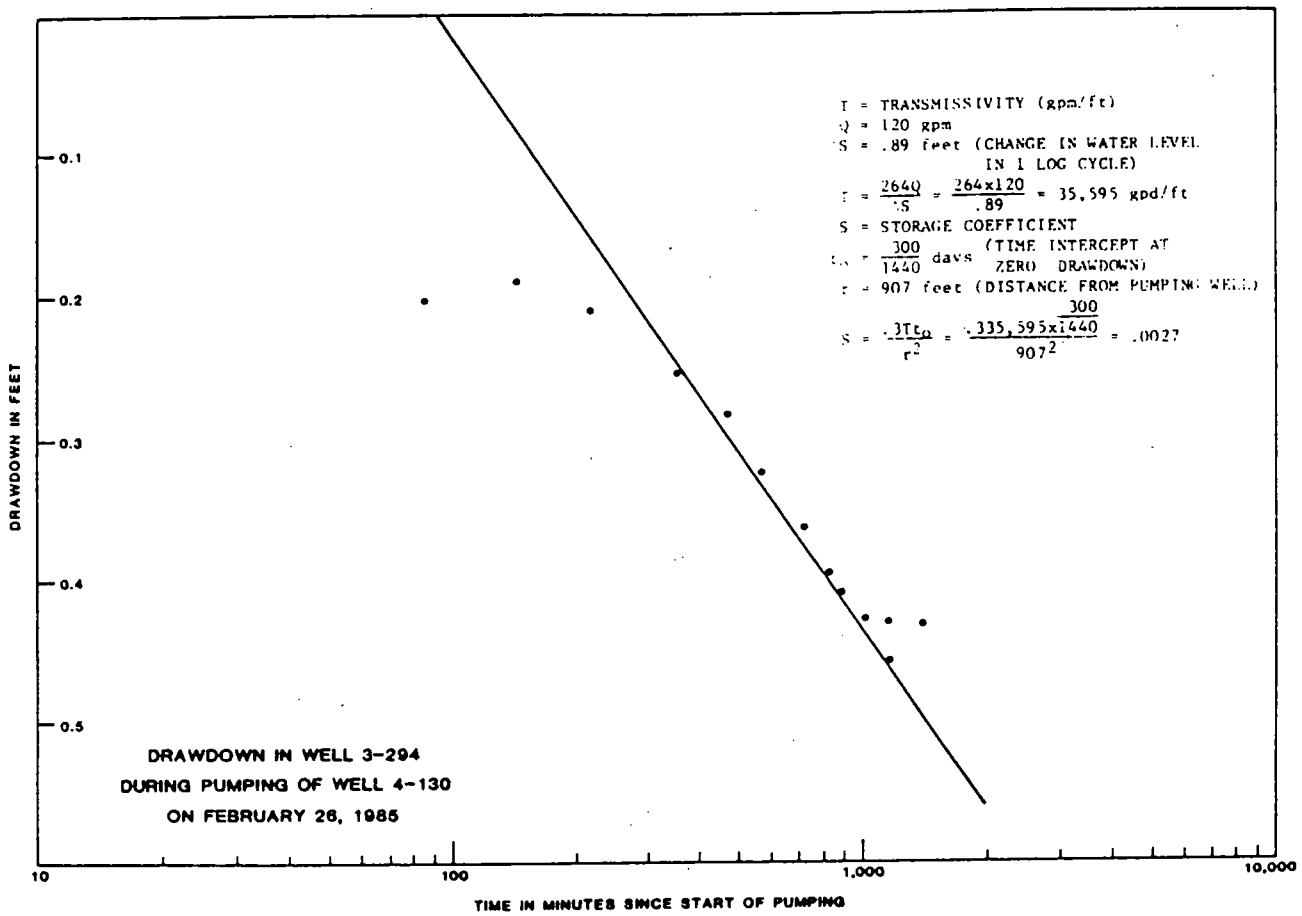
CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT Surface Waters PAGE _____ OF _____ Environmental and Geotechnical Services

WATER LEVEL DATA SHEET (MULT. WELL)

WELL NO.	REFERENCE ELEVATION	DATE	TIME	WATER DEPTH	WATER ELEVATION	NOTES
C-12	754.91	12-28-84	1357	6.98	747.93	

CHKD. BY _____ DATE _____



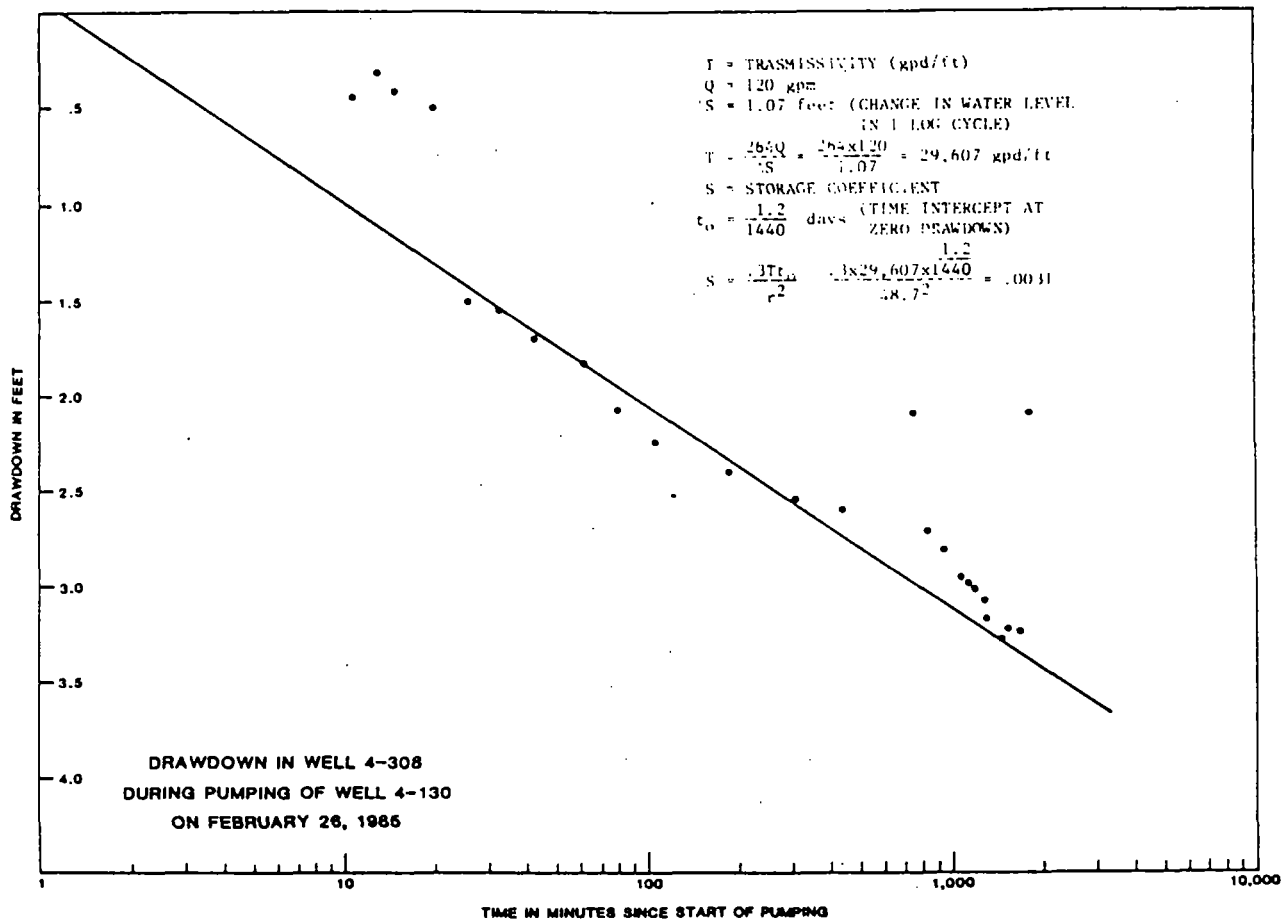
Project No.

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-21



Project No.

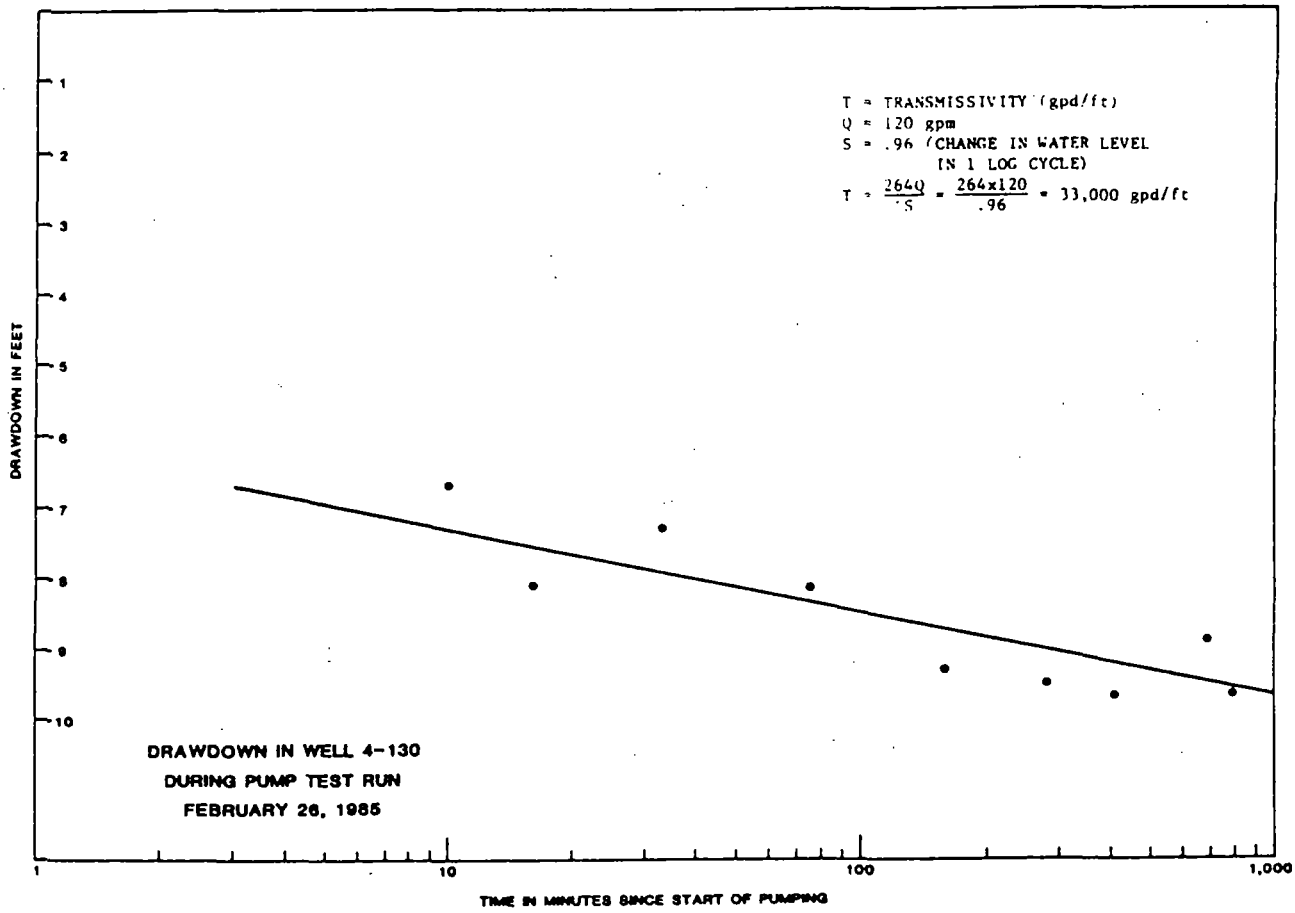
T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-22

Approved for publication by



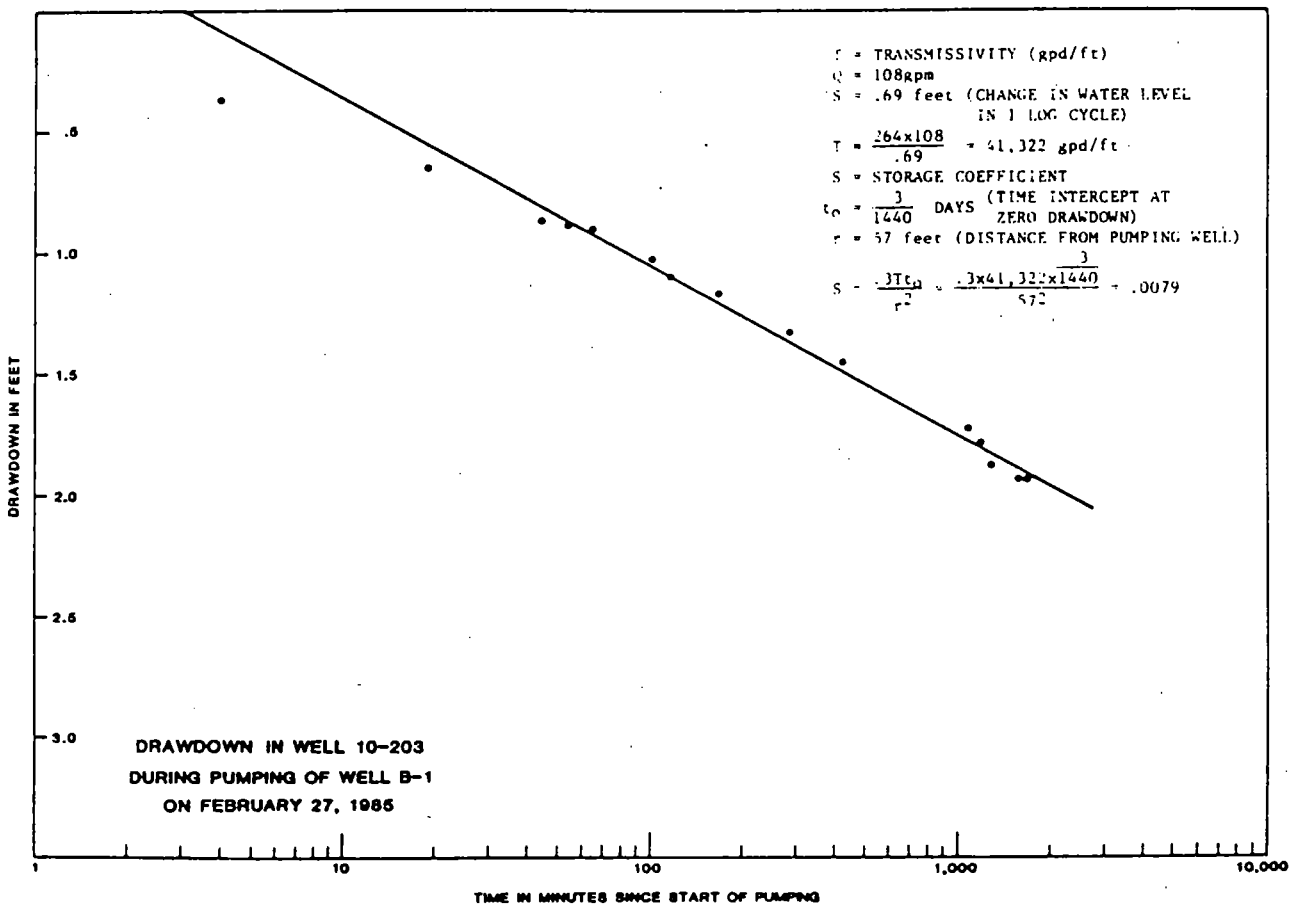
Project No.

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-23



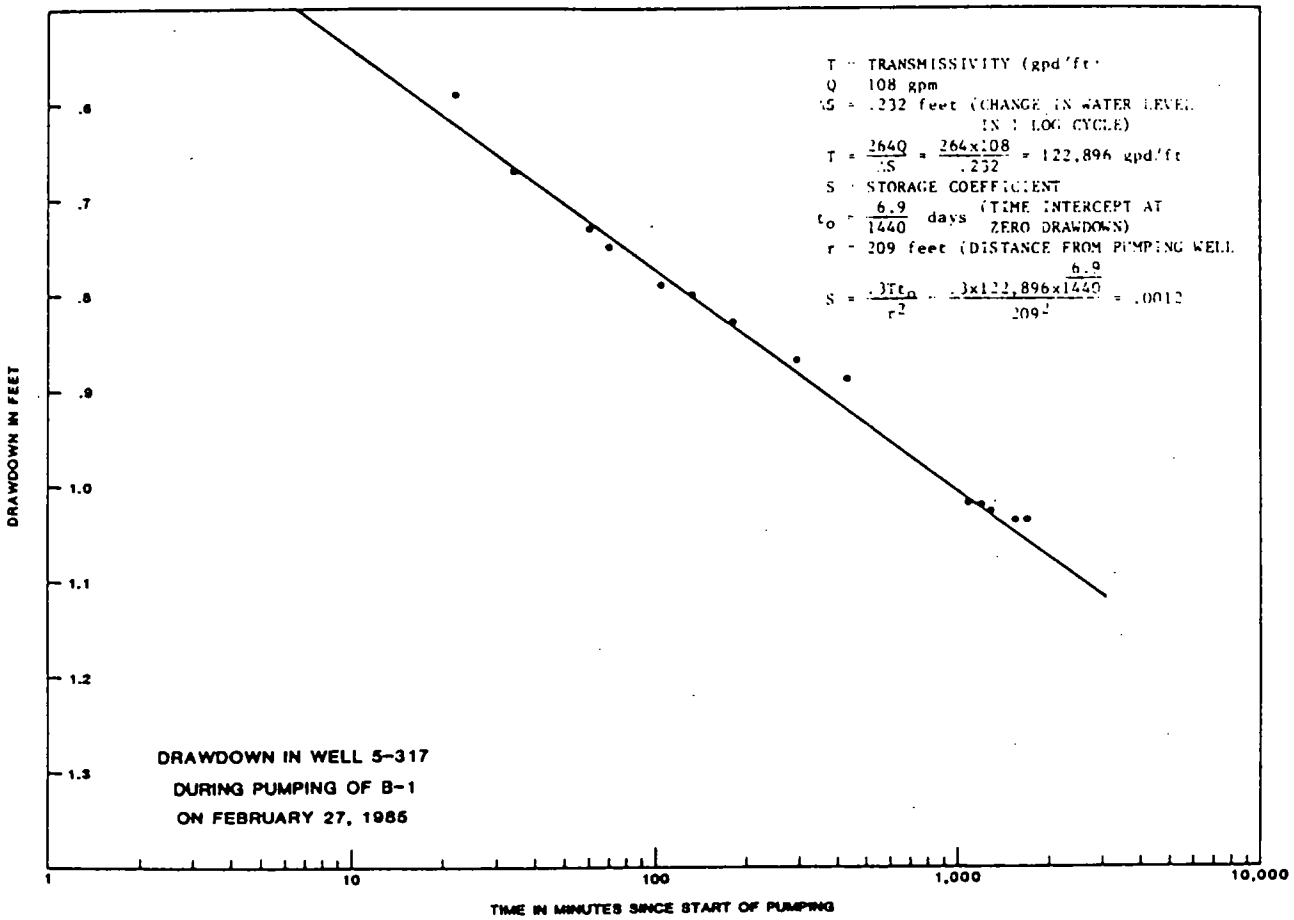
Project No.

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-24



Approved for publication _____ by _____

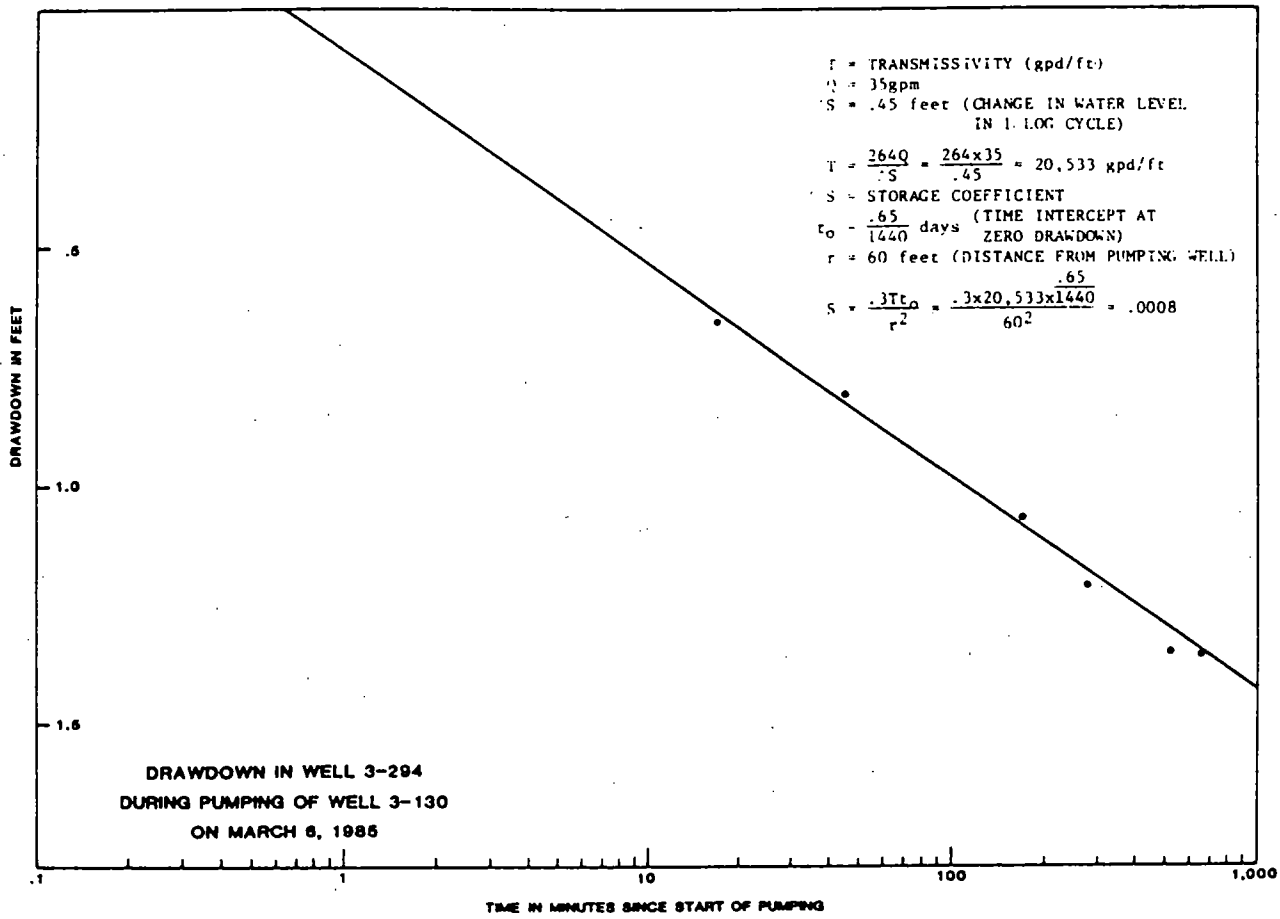
Project No.

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-25



Project No.

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

Figure No.

A-26

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT 4-120 Pump test, Time-Drawdown Data PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 3-294 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
2-26-85				Pumps on 1621 @ 120 gpm
	100 min	.15 ft		
	224	.14		
	356	.16		
	575	.29		
	679	.33		
	778	.40		
	906	.44		
	962	.48		
	1008	.49		
	1102	.53		
	1185	.53		
	1308	.57		
	1379	.53		
	1492	.53		
2-27-85				Pumps off @ 2140

BY _____ DATE _____ NO. 8

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT 4-130 Pump test, Time - Drawdown Data PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 4-308 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
2-26-85				Pumps on 1621 @ 120 gpm
	2 min	1.01 ft		
	9	1.05		
	18	1.19		
	37	1.33		
	55	1.57		
	83	1.74		
	158	1.91		
	285	2.04		
	413	2.10		
	741	1.68		
	801	2.21		
	903	2.32		
	1030	2.46		
	1085	2.49		
	1132	2.51		
	1224	2.57		
	1310	2.67		
	1432	2.77		
	1504	2.72		
	1618	2.74		
2-27-85				Pumps off 2140

BY _____ DATE _____ CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT 4-130 Pump test, Time-Drawdown Data PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 4-130 (Pumping Well) WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
2-26-85				Pumps on 1621 @ 120 gpm
	1 min	5.85 ft		
	3	4.70		
	10	4.69		
	16	6.04		
	33	5.27		
	76	6.01		
	151	7.21		
	283	7.40		
	408	7.57		
	696	6.87		
	798	7.55		
	1217	7.97		
	1309	8.04		
	1430	8.06		
	1498	8.05		
	1755	6.72		
2-27-85				pumps off 2140

DATE _____ BY _____ CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-1 PUMP TEST, TIME-DRAWDOWN DATA PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 10-203 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
2-27-85				B-1 on 1450 @ 108 gpm
	4 min	.36 ft		
	19	.65		
	44	.87		
	54	.89		
	65	.90		
	160	1.03		
	176	1.11		
	223	1.17		
	338	1.34		
	479	1.46		
	1124	1.72		
	1247	1.84		
	1309	1.88		
	1578	1.94		
	1664	1.94		

BY _____ DATE _____

CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-1 Pump Test, Time Drawdown Data PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 5-317 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
2-27-85	14 min	.59 ft		B-1 on 1450 @ 108 gpm
	26	.67		
	51	.73		
	62	.75		
	96	.79		
	124	.80		
	170	.83		
	282	.87		
	416	.89		
	1073	1.19		
	1192	1.20		
	1254	1.25		
	1522	1.35		
	1609	1.35		

BY _____ DATE _____

CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT 3-130 Pump Test, Time - Drawdown Data PAGE _____ OF _____ Environmental and Geotechnical Services

WELL NO.: 3-294 WATER LEVEL REF.: _____

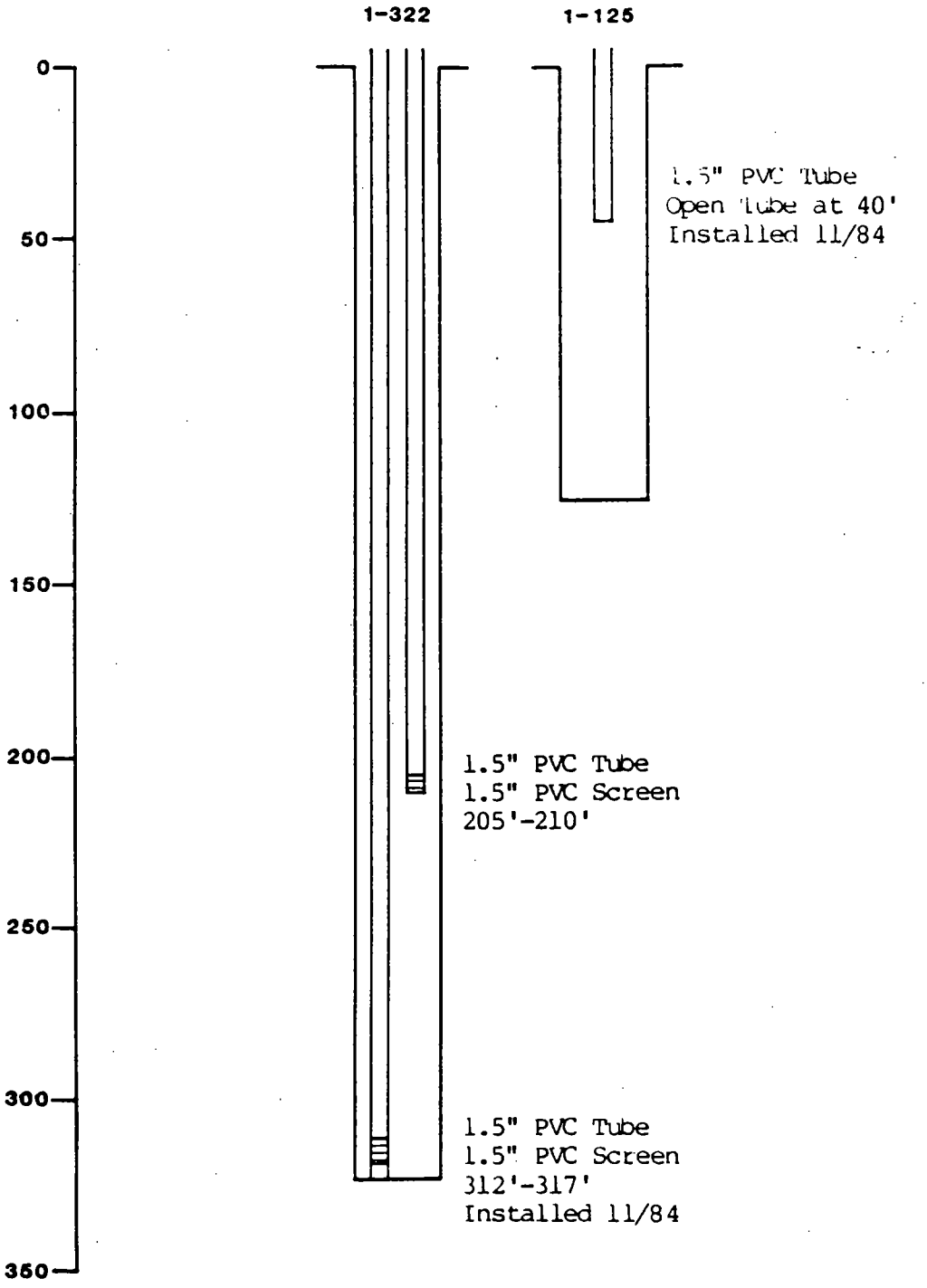
LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
3-6-85				Pump on 1237 @ 35 gpm
	10 min	.66 ft		
	37	.81		
	150	1.07		
	266	1.21		
	488	1.33		
	634	1.36		
3-6-85				Pump off 2311

DATE

BY



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

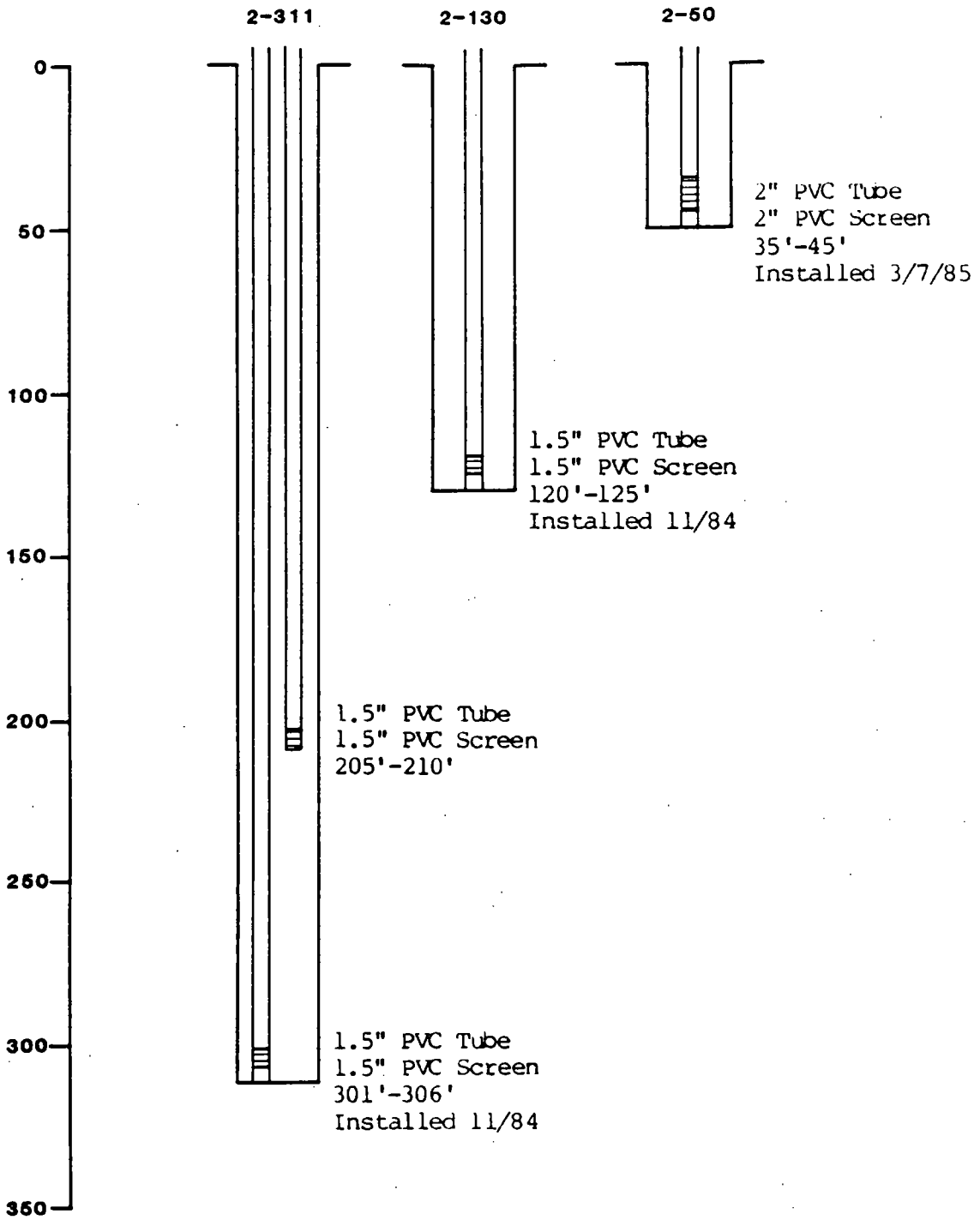
FIGURE A-27

SITE 1

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

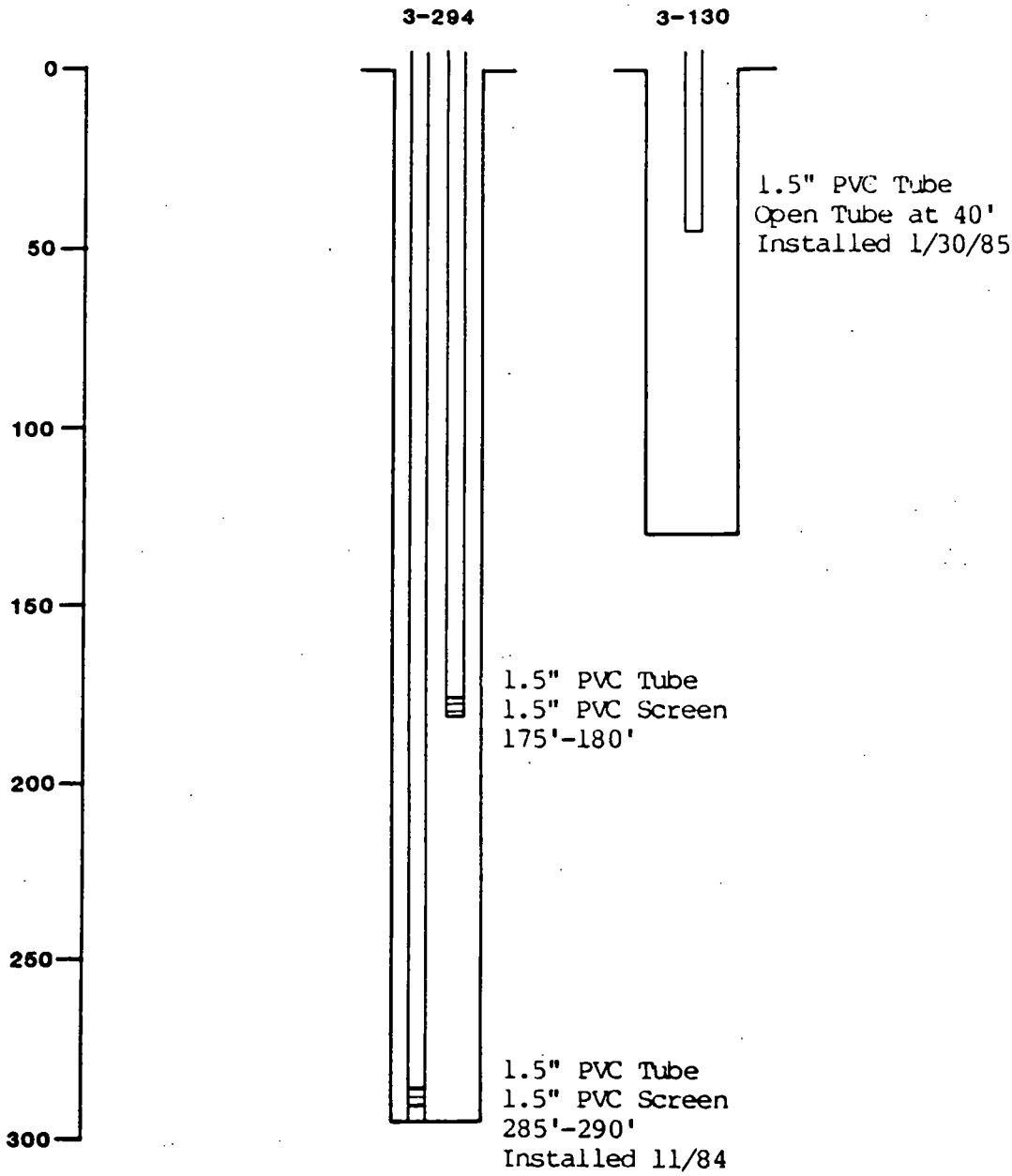
FIGURE A-28

SITE 2

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

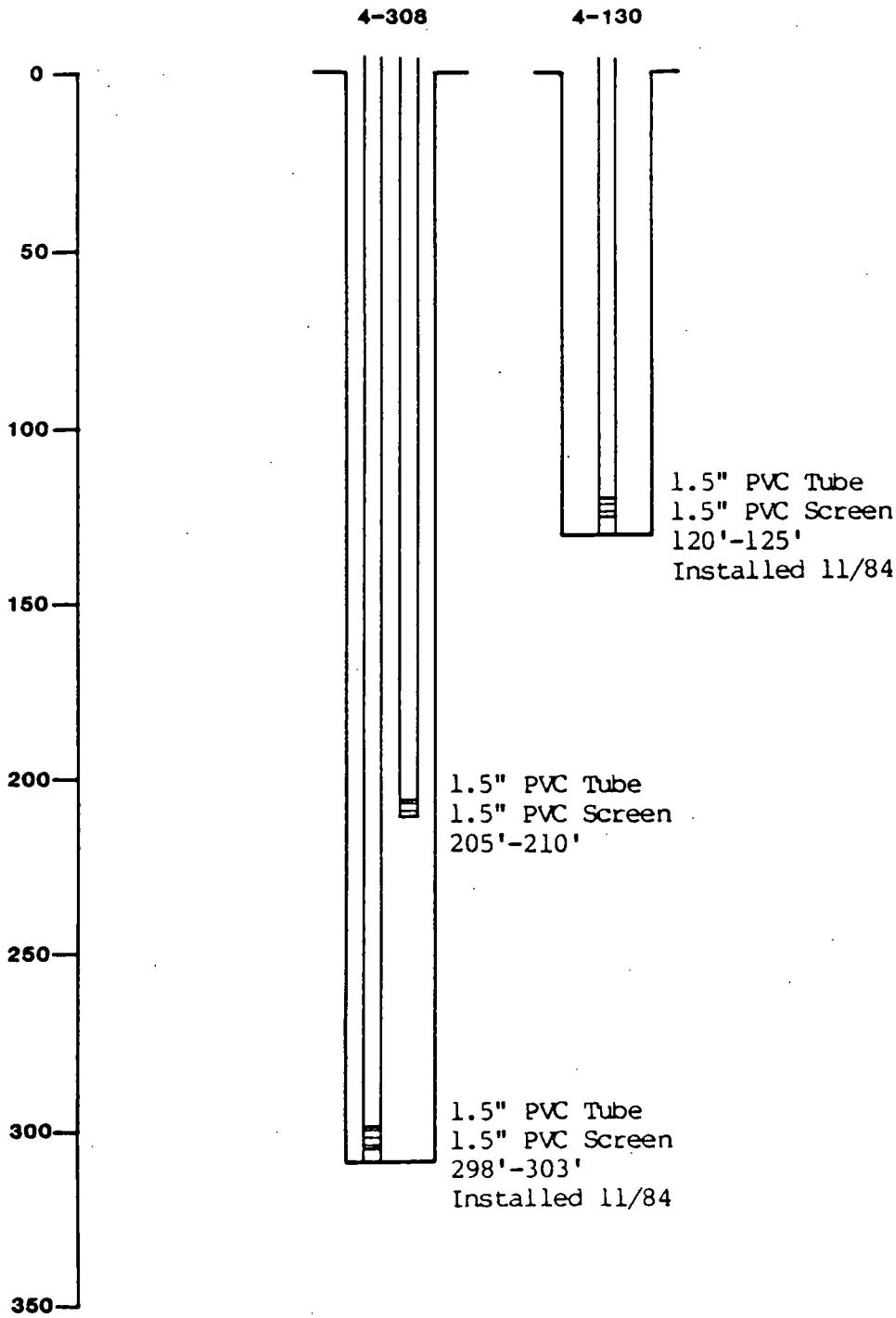
FIGURE A-29

SITE 3

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

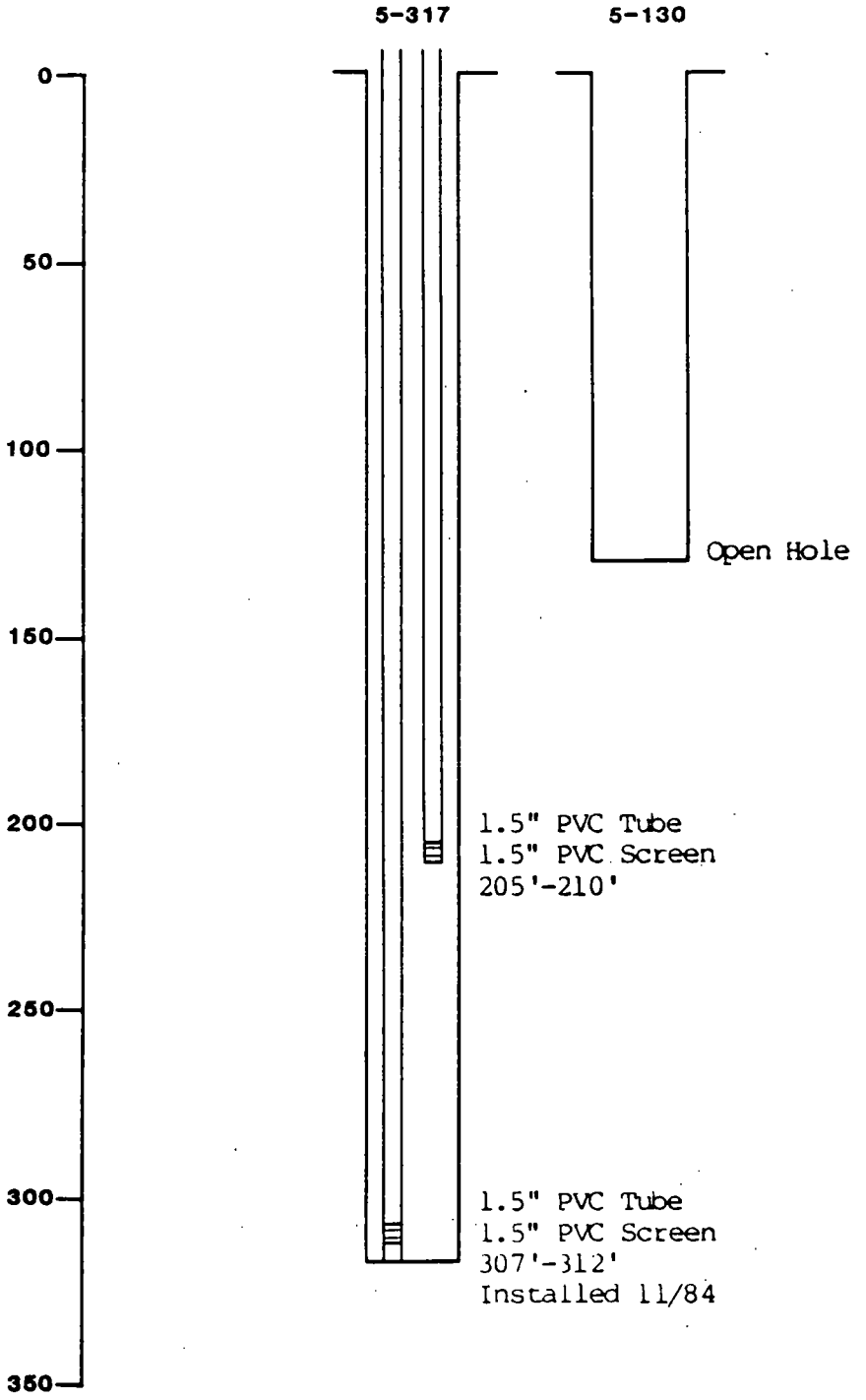
FIGURE A-30

SITE 4

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

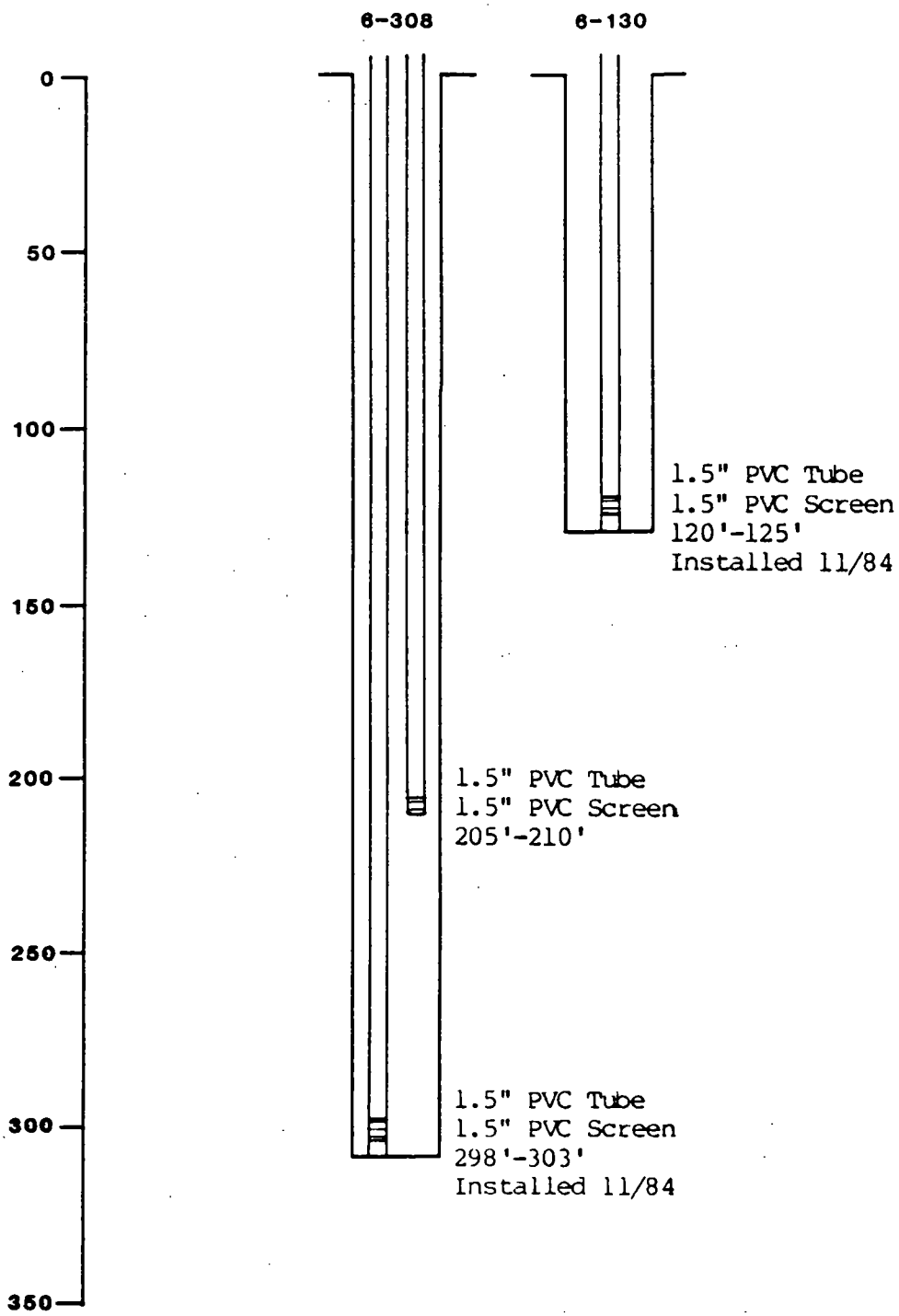
FIGURE A-31

SITE 5

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010 .

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

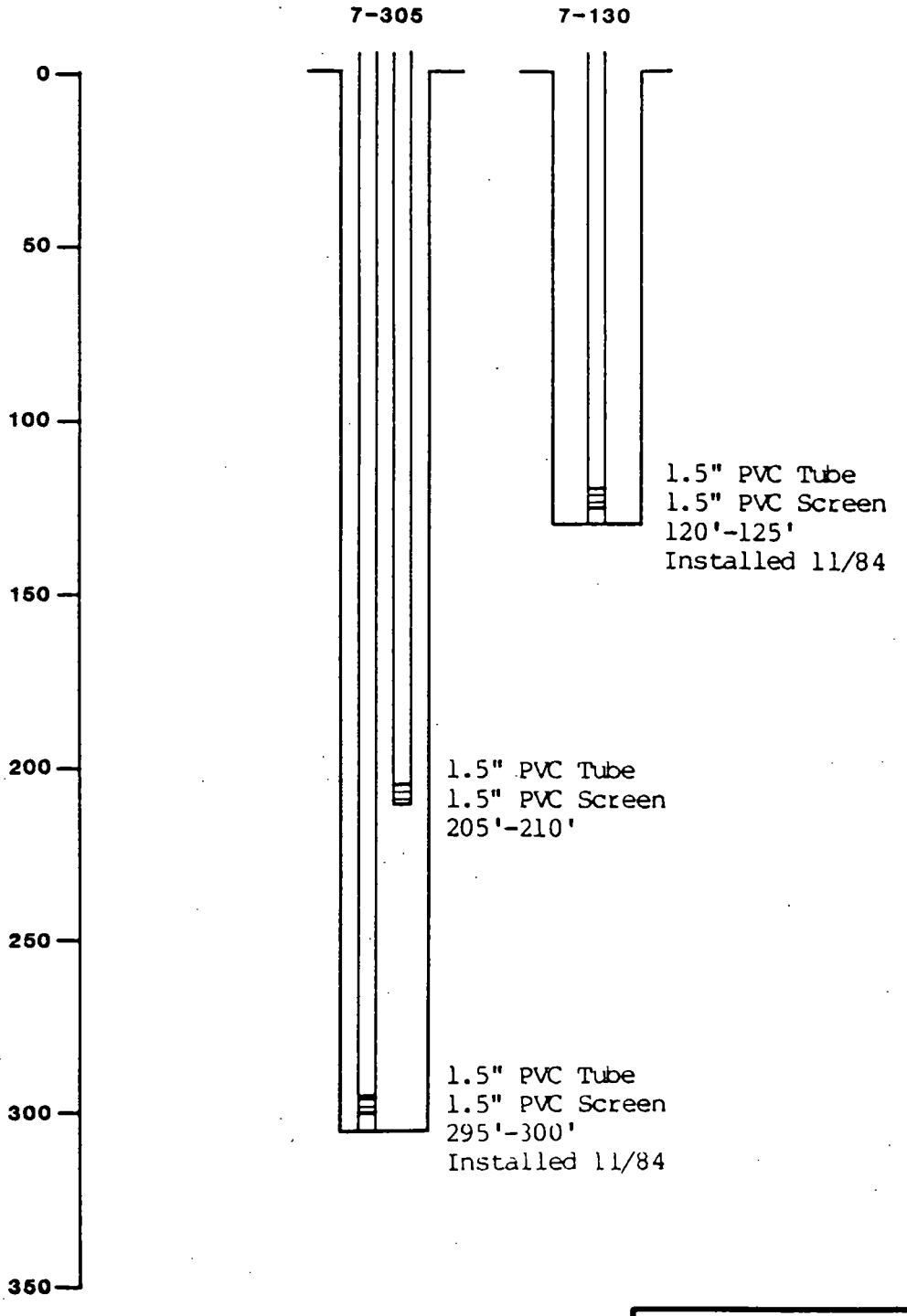
FIGURE A-32

SITE 6

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

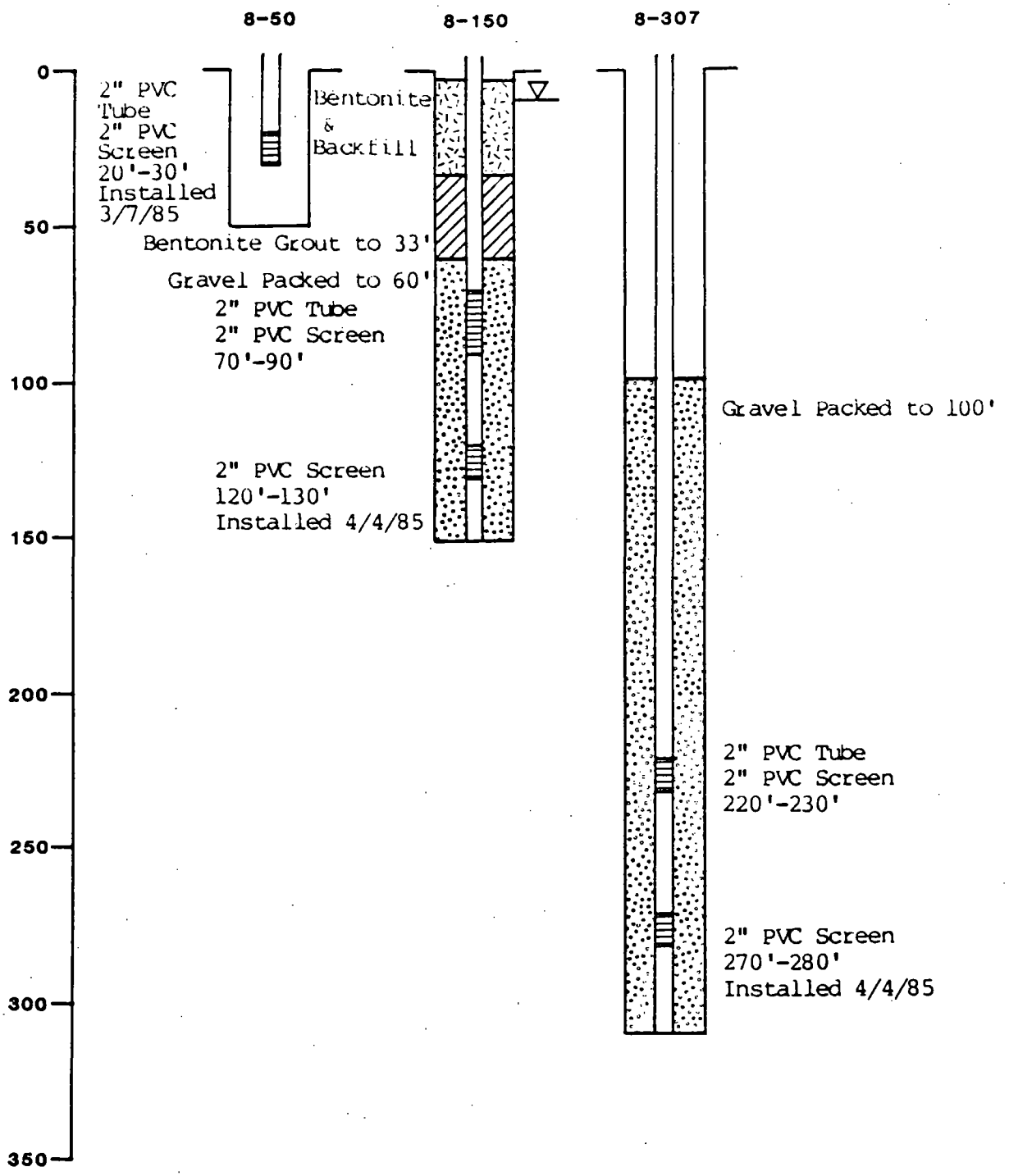
FIGURE A-33

SITE 7

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

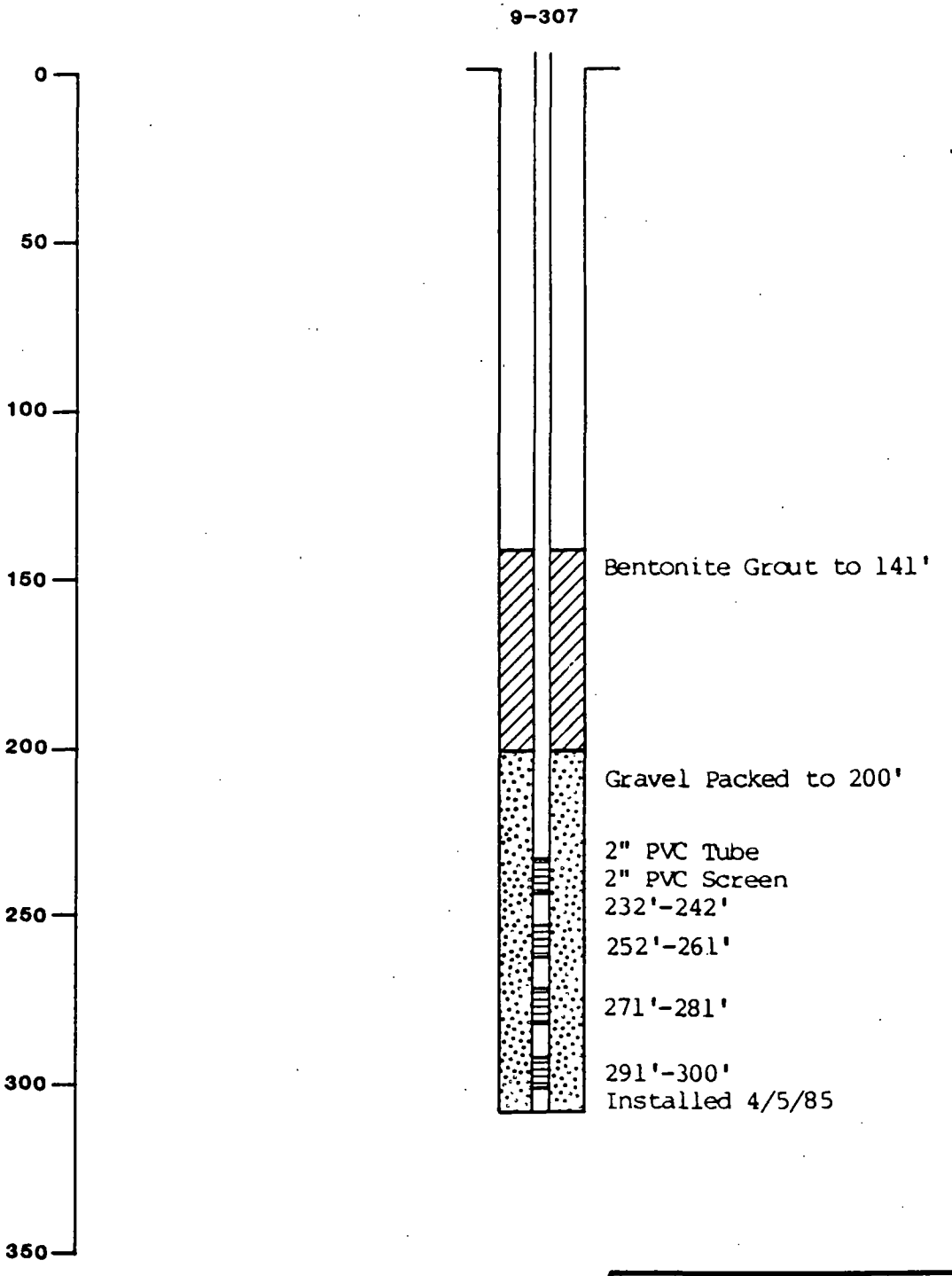
FIGURE A-34

SITE 8

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1986**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

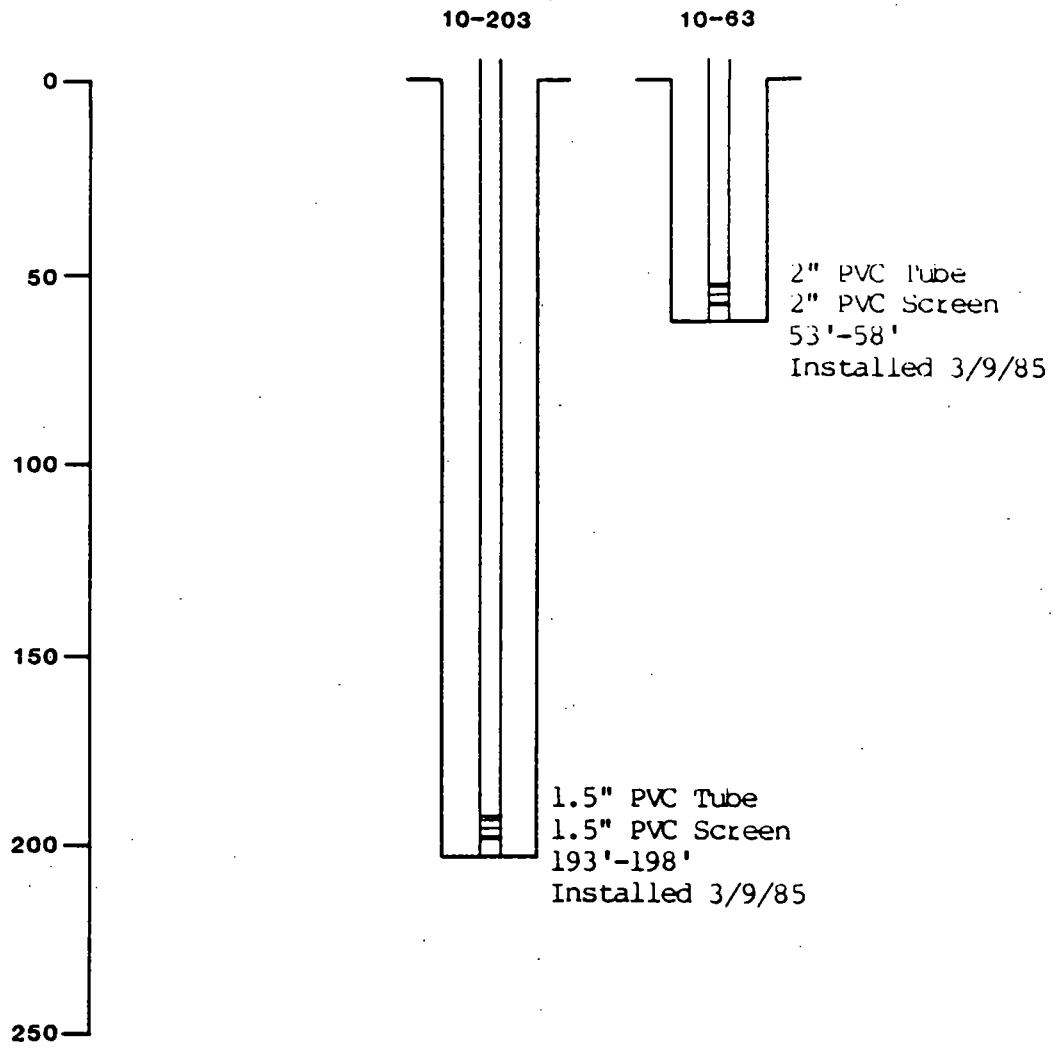
FIGURE A-35

SITE 9

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

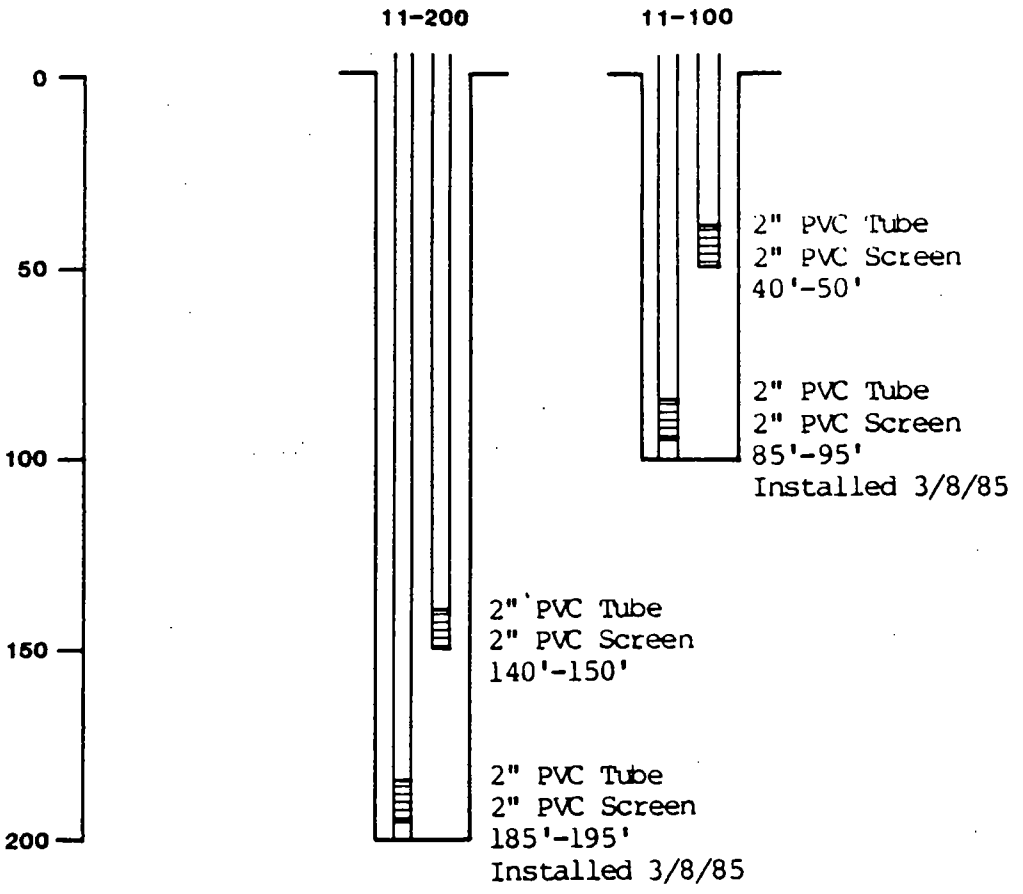
FIGURE A-36

SITE 10

WELL SAMPLE DIAGRAM

PROJ. # 41202 **MAY 16, 1985**

T A GLEASON ASSOCIATES



Note: Screen Slot = .010

ALLIED AUTOMOTIVE
FOSTORIA, OHIO

FIGURE A-37

SITE 11

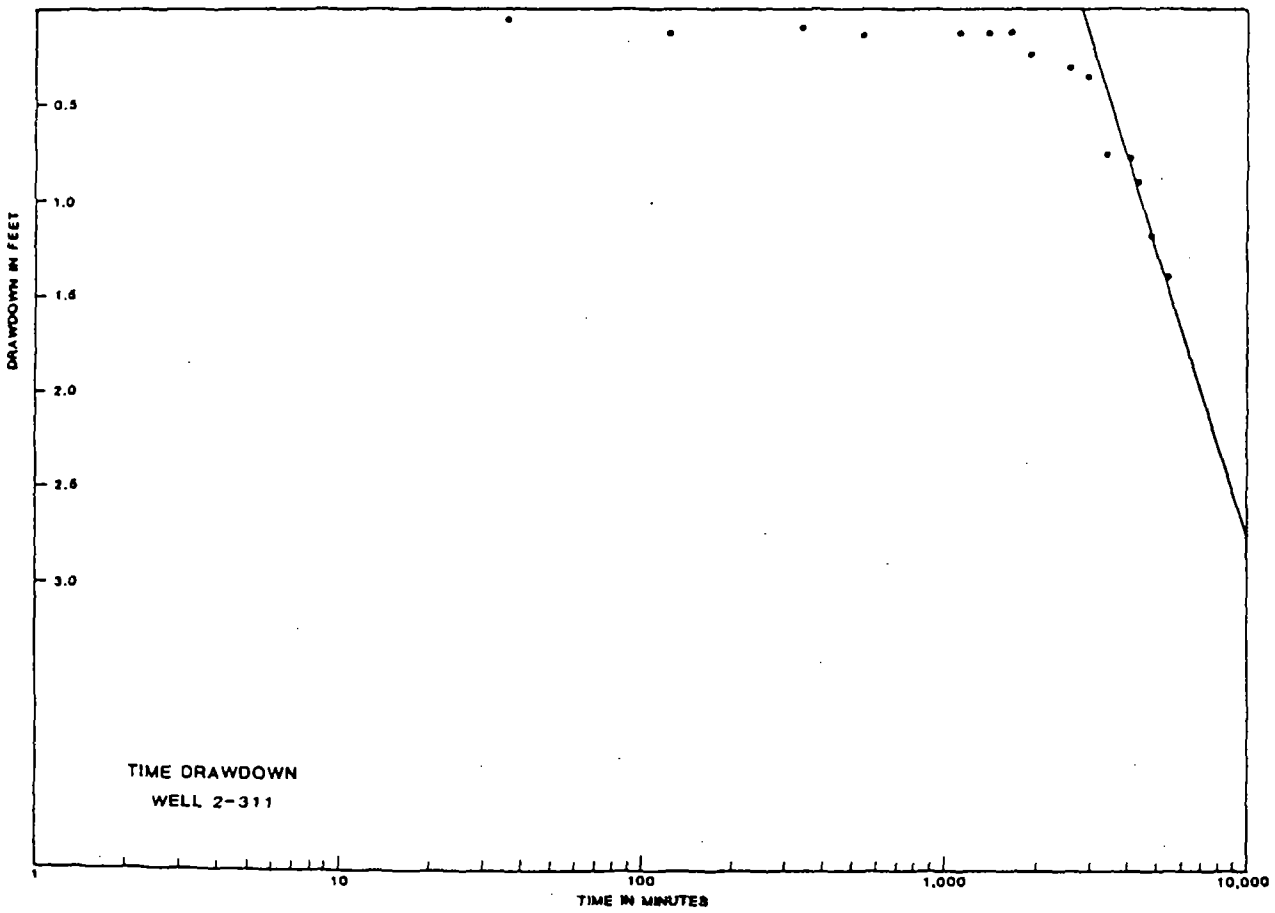
WELL SAMPLE DIAGRAM

PROJ. # 41202 MAY 16, 1985

T A GLEASON ASSOCIATES

APPENDIX B

- TIME-DRAWDOWN GRAPHS, B-3 PUMP TEST
- DISTANCE-DRAWDOWN GRAPHS, B-3 PUMP TEST
- TIME-DRAWDOWN DATA, B-3 PUMP TEST
- TRANSDUCER DATA, B-3 PUMP TEST



T A GLEASON ASSOCIATES

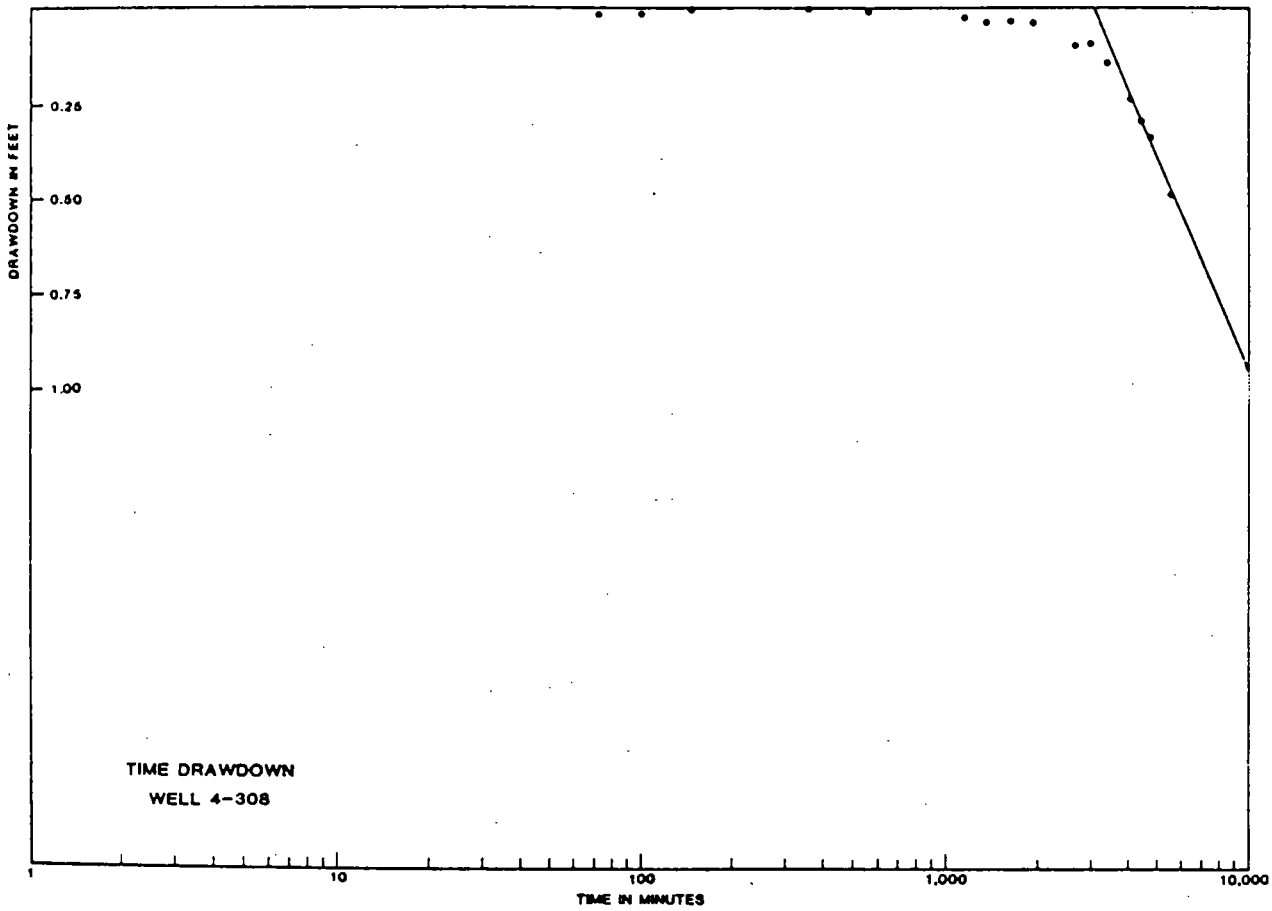
Environmental and Geotechnical Services

TIME-DRAWDOWN

B-3 PUMP TEST

Figure No.

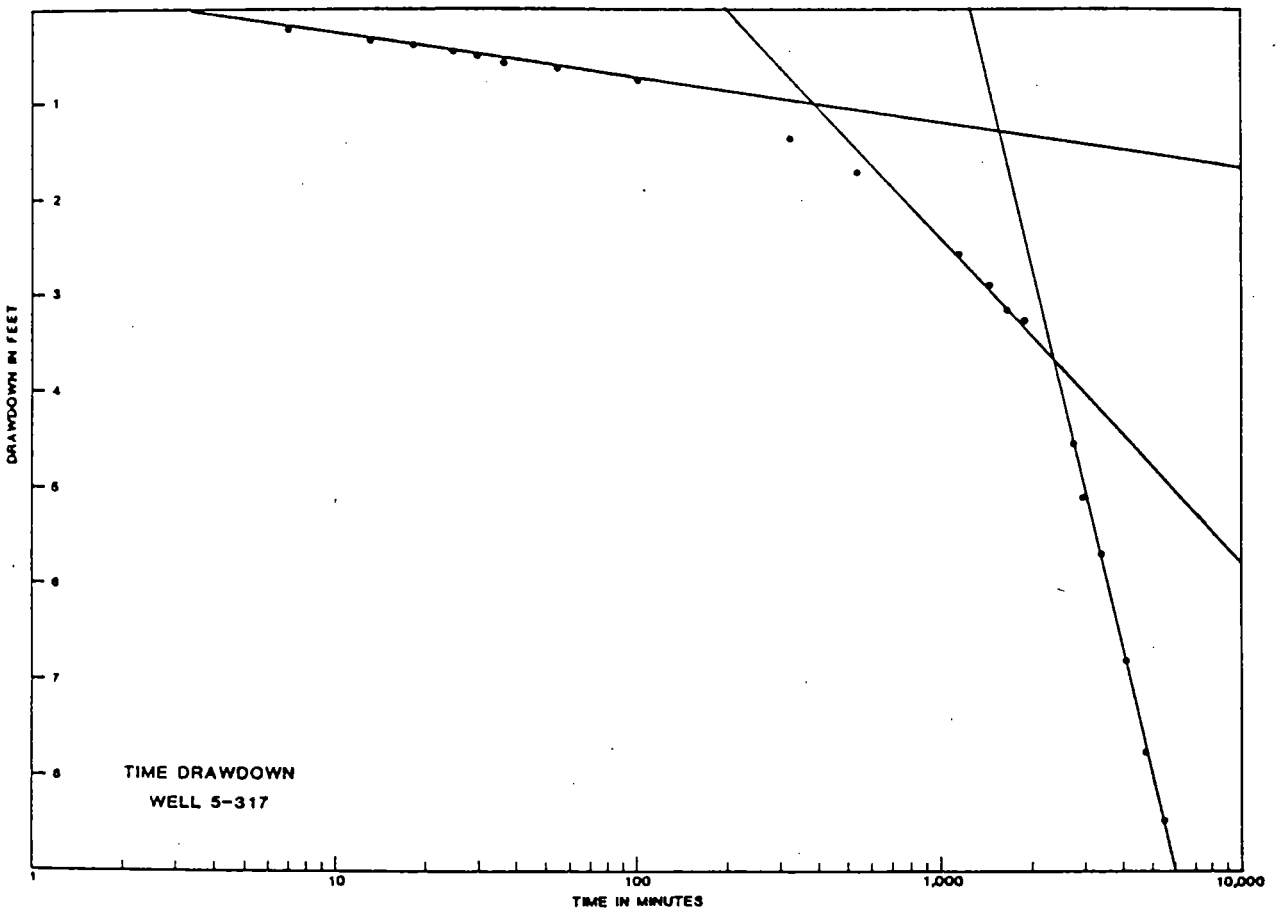
B-1



T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TIME-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-2

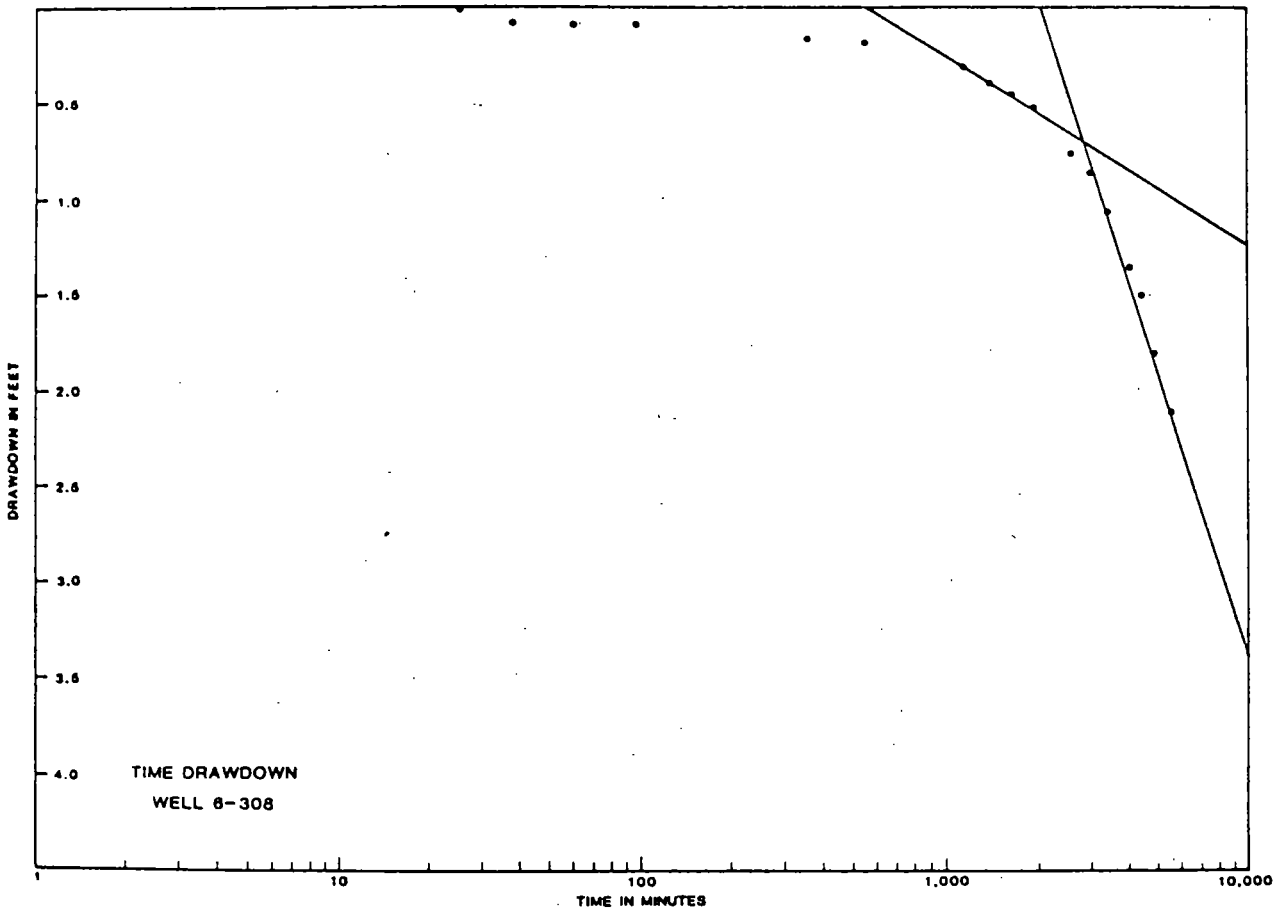


ved for publication _____ by _____

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TIME-DRAWDOWN
B-3 PUMP TEST

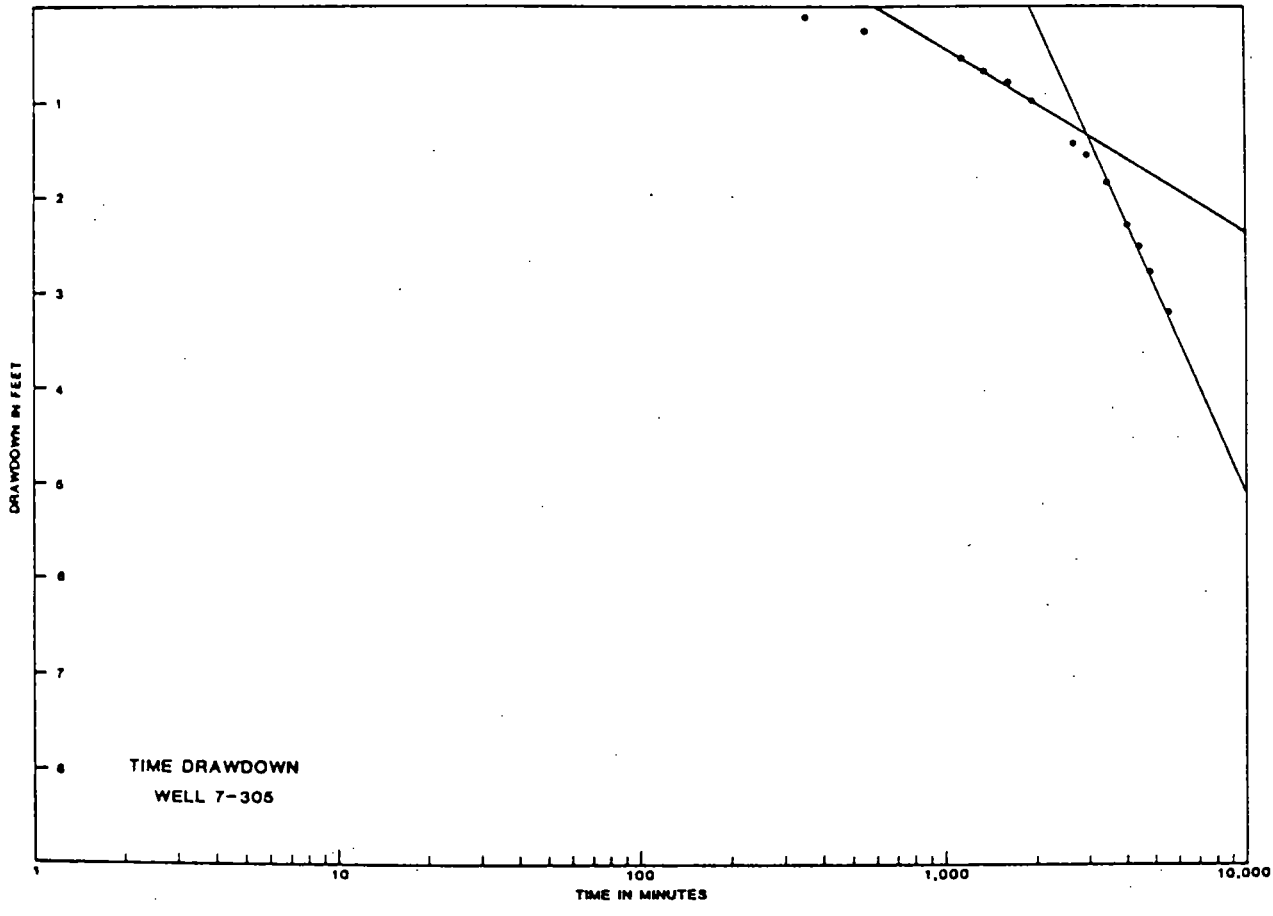
Figure No.
B-3



T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TIME-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-4

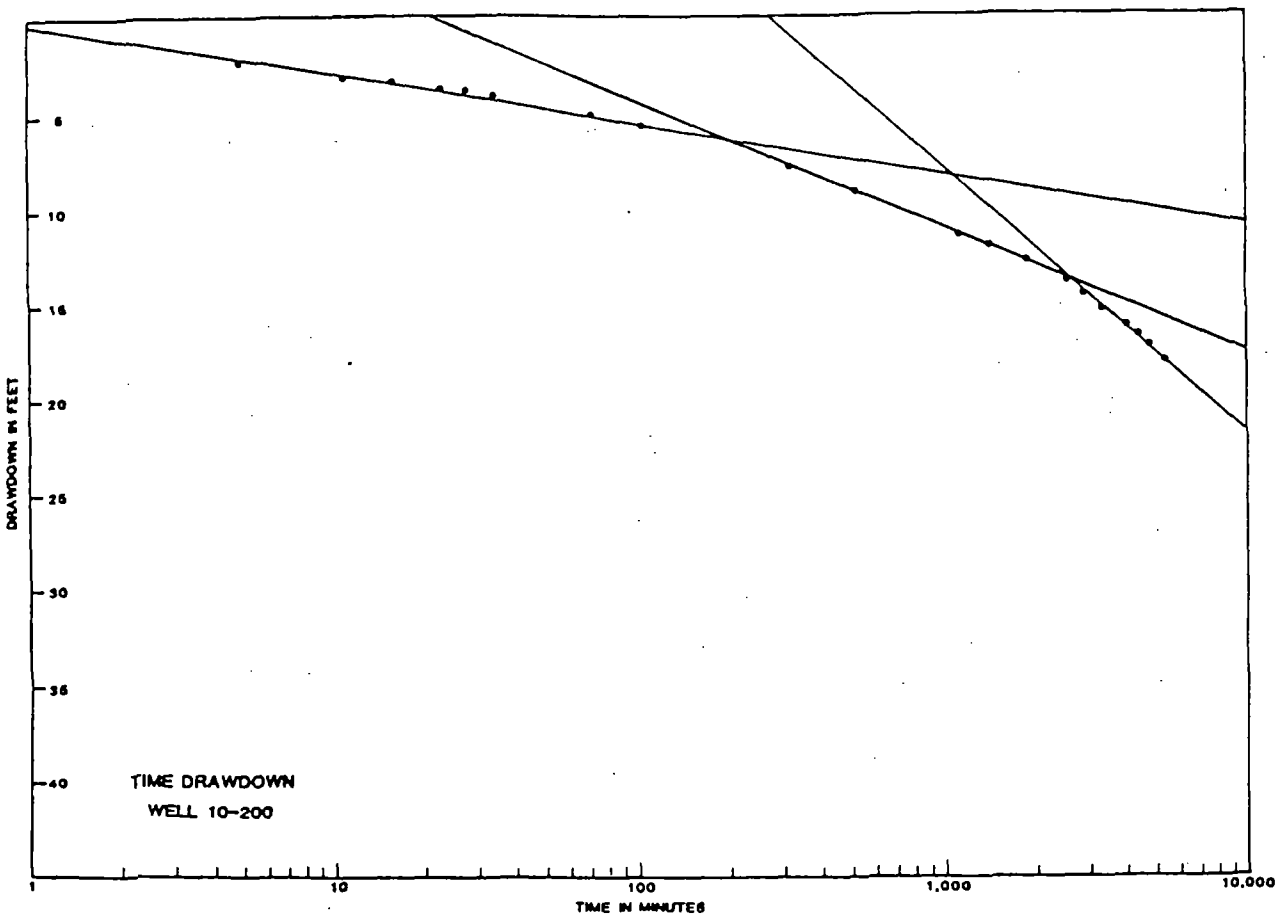


Approved for publication ____ by ____

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

TIME-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-5



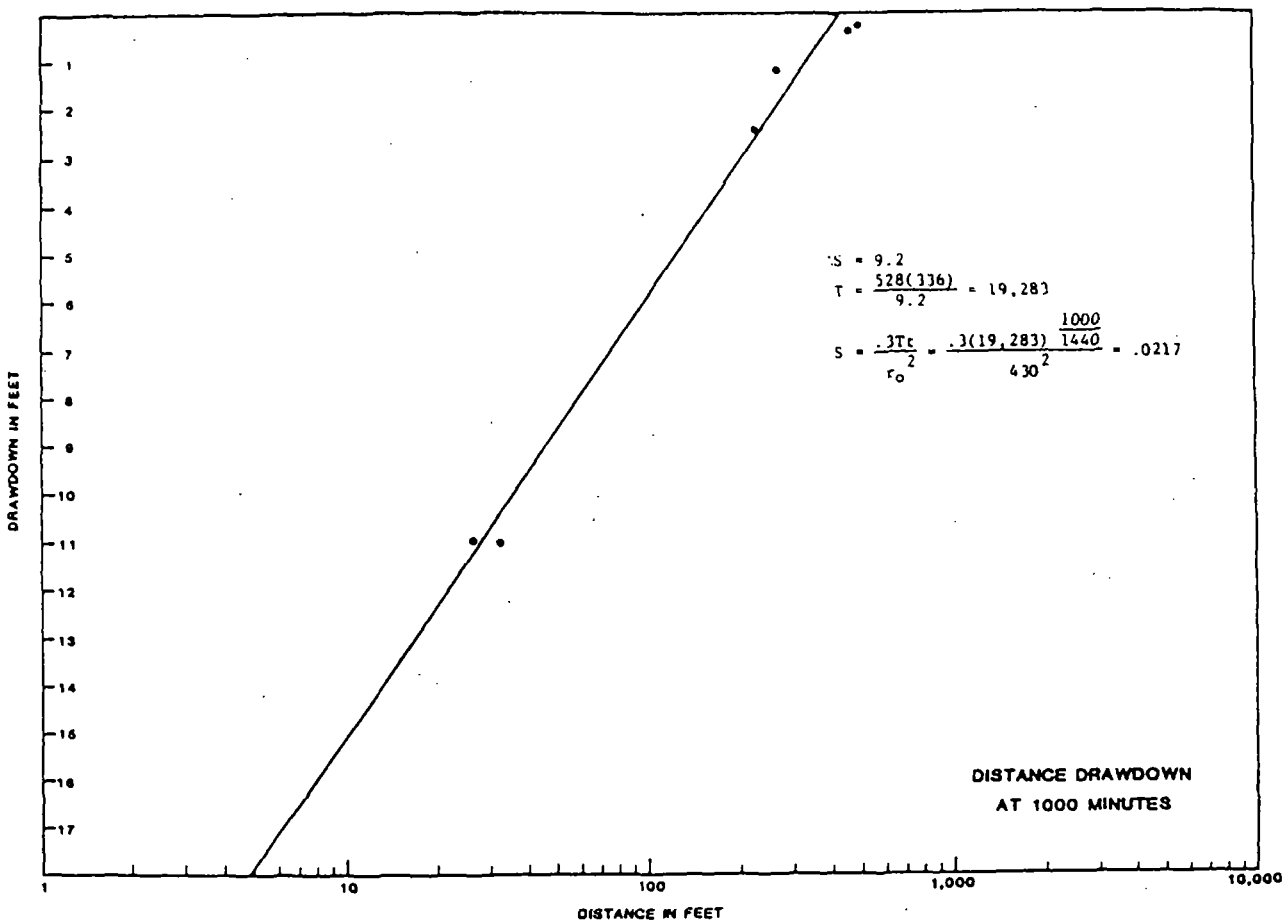
Approved for publication by

T A GLEASON ASSOCIATES

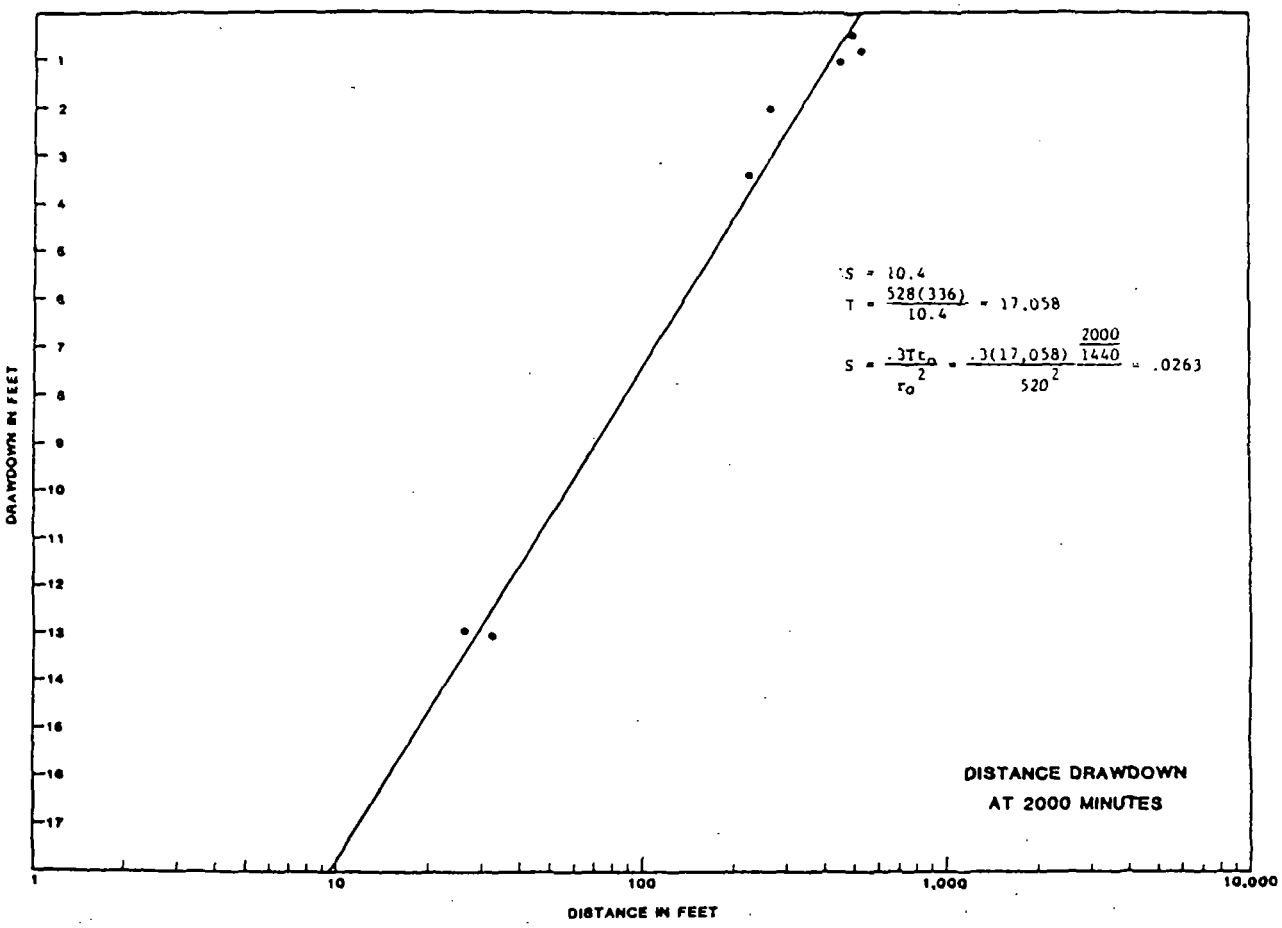
Environmental and Geotechnical Services

TIME-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-6



...oved for publication. ____ by ____

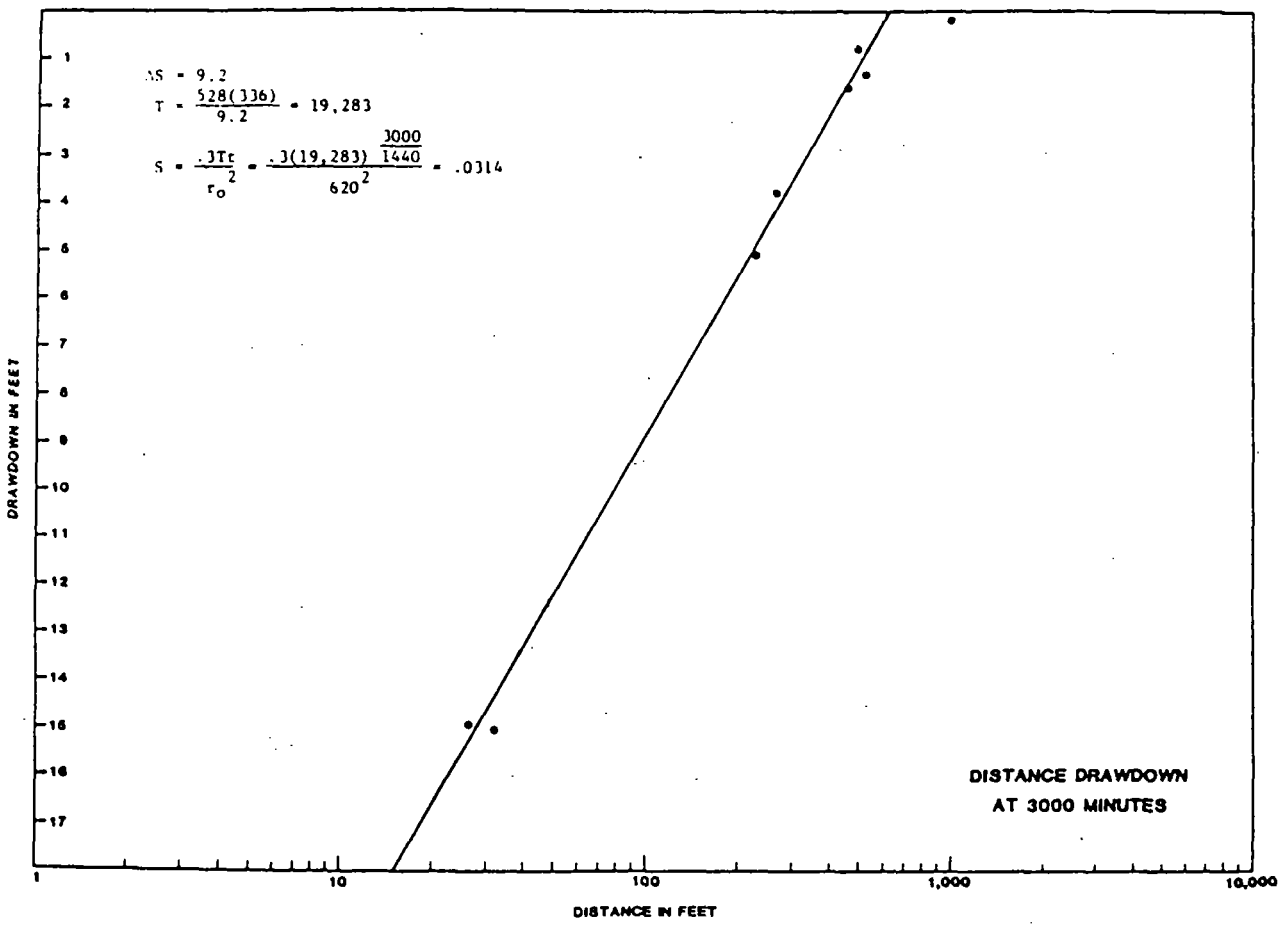


Approved for publication by

TA GLEASON ASSOCIATES
Environmental and Geotechnical Services

DISTANCE-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-8

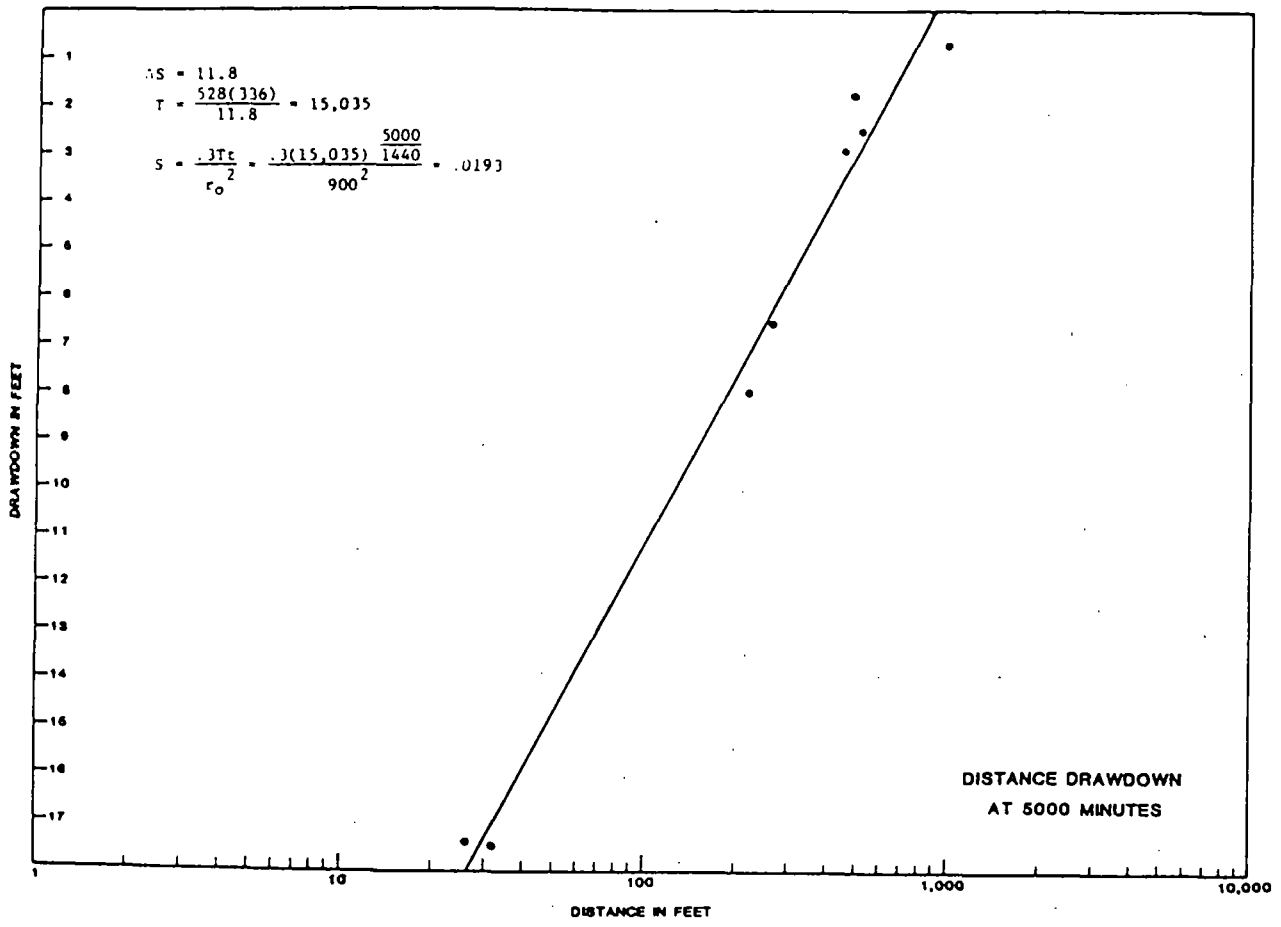


Approved for publication by

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

DISTANCE-DRAWDOWN
B-3 PUMP TEST

Figure No.
B-9


ΔS = 11.8
T = 528(336) / 11.8 = 15,035
S = .3Tt / r_o^2 = .3(15,035) 5000/1440 / 900^2 = .0193
DRAWDOWN IN FEET
1
2
3
4
6
8
7
8
9
10
11
12
13
14
16
18
17
1
10
100
1,000
10,000
DISTANCE IN FEET
DISTANCE DRAWDOWN
AT 5000 MINUTES

CLIENT Allied / Fostoria PROJECT No. 41202

SUBJECT April 1985 Pump Test PAGE 1 OF 11

T A GLEASON ASSOCIATES

Environmental and Geotechnical Services

TRANSDUCER DATA

&X Z/12/84 19:47:
5

CH00 -008.34%
CH06 +018.39%
CH07 +022.98%
CH08 +016.57%
CH09 +026.19%

04/12/84 21:00:01

CH00 -008.23%
CH06 +018.42%
CH07 +022.97%
CH08 +016.60%
CH09 +026.21%

04/1+/84 23:00:01

CH00 -008.24%
CH06 +018.42%
CH07 +023.06%
CH08 +016.60%
CH09 +026.20%

04/13/84 01:00:0

CH00 -008.22%
CH06 +018.42%
CH07 +023.16%
CH08 +016.59%
CH09 +026.22%

04/13/8+ 03:00:01

CH00 -008.18%
CH06 +018.41%
CH07 +023.23%
CH08 +016.57%
CH09 +026.22%

04/+3/8+ +5:0+:01

CH00 -008.16%
CH06 +018.41%
CH07 +023.24%
CH08 +016.59%
CH09 +026.23%

0+/13/84 07:00:+

CH00 -008.20%
CH06 +018.41%
CH07 +023.33%
CH08 +016.68%
CH09 +026.25%

&X 1 1 Z 08:31:
9

CH00 +011.85%
CH01 +031.35%
CH06 +018.32%
CH07 +023.39%
CH08 +016.59%
CH09 -001.92%

8+/ 8/++ 8:++:8+

CH00 +011.82%
CH01 +031.35%
CH06 +018.32%
CH07 +023.53%
CH08 +016.59%
CH09 +143.85%

8+/+8/++ +8:++:8+

CH00 +011.82%
CH01 +031.35%
CH06 +018.32%
CH07 +023.52%
CH08 +016.59%
CH09 +143.84%

88/88/84 88:88:88

CH00 +011.80%
CH01 +031.34%
CH06 +018.32%
CH07 +023.56%
CH08 +016.57%
CH09 +143.86%

88/88/84 88:88:88

CH00 +011.95%
CH01 +031.33%
CH06 +018.31%
CH07 +023.45%
CH08 +016.56%
CH09 +143.87%

04/13/85 12:58:10

11.95%

CH01 +031.36%
CH06 +018.31%
CH07 +023.48%
CH08 +016.53%
CH09 +143.90%

04/13/85 12:58:35

CH00 +011.95%
CH01 +031.35%
CH06 +018.31%
CH07 +023.48%
CH08 +016.53%
CH09 +143.90%

04/13/85 13:06:03

CH00 +011.95%
CH01 +031.35%
CH06 +018.32%
CH07 +023.48%
CH08 +016.53%
CH09 +143.90%

04/13/85 13:32:30

CH00 +011.96%
CH01 +031.36%
CH06 +018.33%
CH07 +023.49%
CH08 +016.52%
CH09 +143.92%

04/13/85 13:34:01

CH00 +011.95%
CH01 +031.37%
CH06 +018.33%
CH07 +023.50%
CH08 +016.53%
CH09 +143.92%

04/13/85 13:50:01

CH00 +010.67%
CH01 +022.00%
CH06 +018.31%
CH07 +023.03%
CH08 +016.50%
CH09 +140.98%

04/13/85 13:55:01

CH00 +010.57%
CH01 +021.89%
CH06 +018.30%
CH07 +022.99%
CH08 +016.49%
CH09 +140.77%

N 4/13/85 13:57:3

CH00 +010.49%
CH01 +021.83%
CH06 +018.30%
CH07 +022.94%
CH08 +016.49%
CH09 +140.67%

04/13/85 14:03:28

CH00 +010.42%
CH01 +021.77%
CH06 +018.29%
CH07 +022.91%
CH08 +016.48%
CH09 +140.49%

04/13/85 14:08:01

CH00 +010.35%
CH01 +021.72%
CH06 +018.29%
CH07 +022.87%
CH08 +016.48%
CH09 +140.36%

04/13/85 13:36:01

CH00 +011.37%
CH01 +024.05%
CH06 +018.33%
CH07 +023.39%
CH08 +016.53%
CH09 +142.53%

04/13/85 13:38:01

CH00 +011.39%
CH01 +025.32%
CH06 +018.34%
CH07 +023.34%
CH08 +016.53%
CH09 +142.57%

04/13/85 13:40:01

CH00 +011.07%
CH01 +022.46%
CH06 +018.33%
CH07 +023.24%
CH08 +016.53%
CH09 +141.84%

04/13/85 13:42:01

CH00 +010.94%
CH01 +022.31%
CH06 +018.33%
CH07 +023.16%
CH08 +016.52%
CH09 +141.54%

04/13/85 13:44:01

CH00 +010.85%
CH01 +022.26%
CH06 +018.32%
CH07 +023.12%
CH08 +016.51%
CH09 +141.36%

04/13/85 14:16:48

CH00	+010.24%
CH01	+021.59%
CH06	+018.28%
CH07	+022.83%
CH08	+016.47%
CH09	+140.13%

04/13/85 14:20:01

CH00	+010.20%
CH01	+021.55%
CH06	+018.28%
CH07	+022.82%
CH08	+016.47%
CH09	+140.05%

N 2/13/85 14:25:
3

04/13/85 14:25:35

CH00	+010.13%
CH01	+021.46%
CH06	+018.27%
CH07	+022.80%
CH08	+016.47%
CH09	+139.91%

04/13/85 14:35:01

CH00	+010.02%
CH01	+021.35%
CH06	+018.27%
CH07	+022.76%
CH08	+016.46%
CH09	+139.69%

04/13/85 14:45:01

CH00	+009.92%
CH01	+021.25%
CH06	+018.26%
CH07	+022.72%
CH08	+016.46%
CH09	+139.49%

04/13/85 14:55:01

CH00	+009.83%
CH01	+021.20%
CH06	+018.25%
CH07	+022.68%
CH08	+016.46%
CH09	+139.32%

N 2/13/85 15:19:
7

CH00	+009.61%
CH01	+021.02%
CH02	-008.55%
CH06	+018.25%
CH07	+022.58%
CH08	+016.44%
CH09	+138.94%

04/13/85 15:40:01

CH00	+009.34%
CH01	+020.89%
CH02	-008.56%
CH06	+018.24%
CH07	+022.52%
CH08	+016.44%
CH09	+138.66%

04/13/85 15:51:01

CH00	+009.27%
CH01	+020.83%
CH02	-008.57%
CH06	+018.23%
CH07	+022.48%
CH08	+016.43%
CH09	+138.51%

04/13/85 15:52:01

CH00	+009.27%
CH01	+020.91%
CH02	-008.58%
CH06	+018.23%
CH07	+022.47%
CH08	+016.43%
CH09	+138.51%

N 2/13/85 15:56:
1

CH00	+009.24%
CH01	+020.90%
CH02	-008.59%
CH06	+018.24%
CH07	+022.46%
CH08	+016.43%
CH09	+138.46%

N 2/13/85 16:14:
2

CH00	+009.14%
CH01	+020.81%
CH02	-008.61%
CH06	+018.23%
CH07	+022.41%
CH08	+016.42%
CH09	+138.26%

04/13/85 16:47:01

CH00	+008.97%
CH01	+020.65%
CH02	-008.58%
CH06	+018.22%
CH07	+022.37%
CH08	+016.41%
CH09	+137.94%

04/13/85 17:17:01

CH00	+008.83%
CH01	+020.53%
CH02	-008.60%
CH06	+018.21%
CH07	+022.29%
CH08	+016.40%
CH09	+137.67%

04/13/85 17:47:01

CH00	+008.72%
CH01	+020.43%
CH02	-008.60%
CH06	+018.22%
CH07	+022.25%
CH08	+016.39%
CH09	+137.44%

04/13/85 18:17:01

CH00	+008.61%
CH01	+020.33%
CH02	-008.55%
CH06	+018.21%
CH07	+022.23%
CH08	+016.38%
CH09	+137.24%

04/13/85 19:00:01

CH00	+008.47%
CH01	+020.17%
CH02	-008.49%
CH06	+018.20%
CH07	+022.16%
CH08	+016.38%
CH09	+136.95%

04/13/85 20:00:01

CH00	+008.28%
CH01	+019.89%
CH02	-008.46%
CH06	+018.19%
CH07	+022.04%
CH08	+016.37%
CH09	+136.58%

04/13/85 21:00:01

CH00	+008.11%
CH01	+019.70%
CH02	-008.42%
CH06	+018.19%
CH07	+021.95%
CH08	+016.37%
CH09	+136.25%

04/13/85 22:00:01

CH00	+007.95%
CH01	+019.51%
CH02	-008.38%
CH06	+018.18%
CH07	+021.90%
CH08	+016.36%
CH09	+135.95%

04/13/85 23:00:01

CH00	+007.82%
CH01	+019.43%
CH02	-008.32%
CH06	+018.19%
CH07	+021.79%
CH08	+016.35%
CH09	+135.69%

04/14/85 00:00:01

CH00	+007.70%
CH01	+019.27%
CH02	-008.31%
CH06	+018.18%
CH07	+021.68%
CH08	+016.34%
CH09	+135.44%

04/14/85 01:00:01

CH00	+007.57%
CH01	+019.11%
CH02	-008.30%
CH06	+018.16%
CH07	+021.58%
CH08	+016.32%
CH09	+135.20%

04/14/85 02:00:01

CH00	+007.46%
CH01	+019.00%
CH02	-008.30%
CH06	+018.16%
CH07	+021.48%
CH08	+016.30%
CH09	+134.99%

04/14/85 03:00:01

CH00	+007.36%
CH01	+018.87%
CH02	-008.32%
CH06	+018.14%
CH07	+021.37%
CH08	+016.29%
CH09	+134.79%

04/14/85 04:00:01

CH00	+007.26%
CH01	+018.71%
CH02	-008.31%
CH06	+018.13%
CH07	+021.28%
CH08	+016.27%
CH09	+134.59%

04/14/85 05:00:01

CH00	+007.17%
CH01	+018.61%
CH02	-008.30%
CH06	+018.12%
CH07	+021.22%
CH08	+016.26%
CH09	+134.41%

04/14/85 06:00:01

CH00	+007.09%
CH01	+018.50%
CH02	-008.30%
CH06	+018.11%
CH07	+021.10%
CH08	+016.24%
CH09	+134.25%

04/14/85 07:00:01

CH00	+007.02%
CH01	+018.39%
CH02	-008.31%
CH06	+018.10%
CH07	+021.04%
CH08	+016.23%
CH09	+134.10%

DATE BY CHKD. DATE

04/14/85 09:00:01

CH00	+006.87%
CH01	+018.21%
CH02	-008.25%
CH06	+018.08%
CH07	+020.93%
CH08	+016.20%
CH09	+133.81%

04/14/85 11:00:01

CH00	+006.73%
CH01	+018.03%
CH02	-008.28%
CH06	+018.08%
CH07	+020.78%
CH08	+016.16%
CH09	+133.54%

04/14/85 13:00:01

CH00	+006.60%
CH01	+017.85%
CH02	-008.34%
CH06	+018.05%
CH07	+020.63%
CH08	+016.10%
CH09	+133.27%

04/14/85 15:00:01

CH00	+006.48%
CH01	+017.67%
CH02	-008.43%
CH06	+018.01%
CH07	+020.50%
CH08	+016.04%
CH09	+133.01%

04/14/85 17:00:01

CH00	+006.38%
CH01	+017.52%
CH02	-008.51%
CH06	+017.97%
CH07	+020.38%
CH08	+015.99%
CH09	+132.79%

04/14/85 19:00:01

CH00	+006.29%
CH01	+017.39%
CH02	-008.53%
CH06	+017.96%
CH07	+020.32%
CH08	+015.97%
CH09	+132.62%

04/14/85 21:00:01

CH00	+006.21%
CH01	+017.26%
CH02	-008.52%
CH06	+017.94%
CH07	+020.26%
CH08	+015.95%
CH09	+132.46%

04/14/85 23:00:01

CH00	+006.13%
CH01	+017.12%
CH02	-008.53%
CH06	+017.92%
CH07	+020.02%
CH08	+015.92%
CH09	+132.28%

04/15/85 01:00:01

CH00	+006.05%
CH01	+016.99%
CH02	-008.54%
CH06	+017.88%
CH07	+019.79%
CH08	+015.87%
CH09	+132.10%

04/15/85 03:00:01

CH00	+005.96%
CH01	+016.84%
CH02	-008.54%
CH06	+017.84%
CH07	+019.61%
CH08	+015.83%
CH09	+131.92%

04/15/85 05:00:01

CH00	+005.87%
CH01	+016.70%
CH02	-008.53%
CH06	+017.81%
CH07	+019.44%
CH08	+015.79%
CH09	+131.75%

04/15/85 07:00:01

CH00	+005.81%
CH01	+016.54%
CH02	-008.49%
CH06	+017.80%
CH07	+019.30%
CH08	+015.77%
CH09	+131.61%

04/15/85 09:00:01

CH00	+005.75%
CH01	+016.41%
CH02	-008.48%
CH06	+017.77%
CH07	+019.06%
CH08	+015.74%
CH09	+131.47%

04/15/85 11:00:01

CH00	+005.67%
CH01	+016.28%
CH02	-008.48%
CH06	+017.76%
CH07	+018.86%
CH08	+015.69%
CH09	+131.32%

04/15/85 13:00:01

CH00	+005.60%
CH01	+016.15%
CH02	-008.53%
CH06	+017.73%
CH07	+018.65%
CH08	+015.63%
CH09	+131.16%

04/15/85 15:00:01

CH00	+005.46%
CH01	+014.83%
CH02	-008.60%
CH06	+017.70%
CH07	+018.43%
CH08	+015.52%
CH09	+130.82%

04/15/85 17:00:01

CH00	+005.38%
CH01	+014.71%
CH02	-008.69%
CH06	+017.66%
CH07	+018.25%
CH08	+015.51%
CH09	+130.65%

04/15/85 17:18:49

CH00	+005.36%
CH01	+014.71%
CH02	-008.70%
CH06	+017.66%
CH07	+018.23%
CH08	+015.51%
CH09	+130.63%

04/15/85 19:00:01

CH00	+005.30%
CH01	+014.55%
CH02	-008.76%
CH06	+017.64%
CH07	+018.13%
CH08	+015.48%
CH09	+130.49%

04/15/85 21:00:01

CH00	+005.22%
CH01	+014.36%
CH02	-008.27%
CH06	+017.61%
CH07	+018.04%
CH08	+015.46%
CH09	+130.34%

04/15/85 23:00:01

CH00	+005.14%
CH01	+014.19%
CH02	-008.77%
CH06	+017.57%
CH07	+017.95%
CH08	+015.44%
CH09	+130.17%

04/16/85 01:00:01

CH00	+005.08%
CH01	+014.31%
CH02	-008.74%
CH06	+017.53%
CH07	+017.80%
CH08	+015.42%
CH09	+130.07%

04/16/85 03:00:01

CH00	+005.02%
CH01	+014.30%
CH02	-008.72%
CH06	+017.50%
CH07	+017.68%
CH08	+015.38%
CH09	+129.95%

04/16/85 05:00:01

CH00	+004.96%
CH01	+014.21%
CH02	-008.68%
CH06	+017.47%
CH07	+017.56%
CH08	+015.36%
CH09	+129.84%

04/16/85 07:00:01

CH00	+004.93%
CH01	+014.07%
CH02	-008.61%
CH06	+017.46%
CH07	+017.42%
CH08	+015.34%
CH09	+129.76%

04/16/85 09:00:01

CH00	+004.84%
CH01	+013.20%
CH02	-008.54%
CH06	+017.44%
CH07	+017.22%
CH08	+015.31%
CH09	+129.55%

04/16/85 11:00:01

CH00	+004.76%
CH01	+013.04%
CH02	-008.50%
CH06	+017.44%
CH07	+017.10%
CH08	+015.29%
CH09	+129.40%

04/16/85 13:00:01

CH00	+004.70%
CH01	+012.95%
CH02	-008.48%
CH06	+017.42%
CH07	+016.92%
CH08	+015.25%
CH09	+129.27%

04/16/85 15:00:01

CH00	+004.65%
CH01	+012.81%
CH02	-008.47%
CH06	+017.41%
CH07	+016.84%
CH08	+015.23%
CH09	+129.17%

04/16/85 17:00:01

CH00	+004.62%
CH01	+012.72%
CH02	-008.48%
CH06	+017.41%
CH07	+016.79%
CH08	+015.22%
CH09	+129.09%

04/16/85 19:00:01

CH00	+004.58%
CH01	+012.67%
CH02	-008.47%
CH06	+017.41%
CH07	+016.75%
CH08	+015.23%
CH09	+129.02%

04/1 /85 21:00:01

CH00	+004.54%
CH01	+012.54%
CH02	-008.40%
CH06	+017.40%
CH07	+016.72%
CH08	+015.25%
CH09	+128.95%

04/16/85 23:00:01

CH00	+004.49%
CH01	+012.44%
CH02	-008.34%
CH06	+017.39%
CH07	+016.57%
CH08	+015.25%
CH09	+128.85%

04/17/85 01:00:01

CH00	+004.44%
CH01	+012.25%
CH02	-008.27%
CH06	+017.37%
CH07	+016.57%
CH08	+015.24%
CH09	+128.76%

04/17/85 03: 0:01

CH00	+004.38%
CH01	+012.17%
CH02	-008.21%
CH06	+017.35%
CH07	+016.47%
CH08	+015.21%
CH09	+128.64%

04/17/95 05:00:01

CH00	+004.34%
CH01	+012.04%
CH02	-008.13%
CH06	+017.32%
CH07	+016.38%
CH08	+015.19%
CH09	+128.55%

04/17/85 07:00:01

CH00	+004.28%
CH01	+011.48%
CH02	-008.04%
CH06	+017.31%
CH07	+016.29%
CH08	+015.17%
CH09	+128.42%

04/17/85 09:00:01

CH00	+004.24%
CH01	+011.17%
CH02	-007.95%
CH06	+017.28%
CH07	+016.11%
CH08	+015.16%
CH09	+128.32%

04/17/85 10:01:20

CH00	+004.59%
CH01	+023.79%
CH02	-007.99%
CH06	+017.25%
CH07	+016.08%
CH08	+015.11%
CH09	+129.63%

04/17/85 10:16:01

CH00	+005.24%
CH01	+024.87%
CH02	-007.95%
CH06	+017.28%
CH07	+016.50%
CH08	+015.17%
CH09	+131.00%

DATE
DATE
BY
CHKD

04/17/85 10:31:01

CH00	+005.54%
CH01	+025.15%
CH02	-007.96%
CH06	+017.32%
CH07	+016.56%
CH08	+015.18%
CH09	+131.60%

04/17/85 10:46:01

CH00	+005.77%
CH01	+025.37%
CH02	-007.97%
CH06	+017.33%
CH07	+016.60%
CH08	+015.18%
CH09	+132.02%

04/17/85 11:01:01

CH00	+005.94%
CH01	+025.55%
CH02	-007.97%
CH06	+017.33%
CH07	+016.64%
CH08	+015.18%
CH09	+132.37%

04/17/85 11:16:01

CH00	+006.10%
CH01	+025.69%
CH02	-007.98%
CH06	+017.33%
CH07	+016.66%
CH08	+015.18%
CH09	+132.66%

04/17/85 11:31:01

CH00	+006.24%
CH01	+025.82%
CH02	-007.97%
CH06	+017.33%
CH07	+016.70%
CH08	+015.17%
CH09	+132.93%

04/17/85 11:46:01

CH00	+006.38%
CH01	+025.95%
CH02	-007.95%
CH06	+017.32%
CH07	+016.74%
CH08	+015.17%
CH09	+133.19%

04/17/85 12:01:01

CH00	+006.49%
CH01	+026.05%
CH02	-007.97%
CH06	+017.32%
CH07	+016.77%
CH08	+015.18%
CH09	+133.40%

04/17/85 12:31:01

CH00	+006.69%
CH01	+026.24%
CH02	-007.98%
CH06	+017.31%
CH07	+016.80%
CH08	+015.16%
CH09	+133.79%

04/17/85 13:53:01

CH00	+007.15%
CH01	+026.68%
CH02	-008.01%
CH06	+017.30%
CH07	+016.99%
CH08	+015.13%
CH09	+134.66%

04/17/85 14:28:01

CH00	+007.30%
CH01	+026.83%
CH02	-008.04%
CH06	+017.29%
CH07	+017.07%
CH08	+015.12%
CH09	+134.95%

04/17/85 14:43:01

CH00	+007.36%
CH01	+026.89%
CH02	-008.06%
CH06	+017.28%
CH07	+017.11%
CH08	+015.11%
CH09	+135.08%

04/17/85 14:58:01

CH00	+007.42%
CH01	+026.95%
CH02	-008.07%
CH06	+017.28%
CH07	+017.13%
CH08	+015.10%
CH09	+135.19%

04/17/85 15:13:01

CH00	+007.48%
CH01	+027.00%
CH02	-008.10%
CH06	+017.28%
CH07	+017.14%
CH08	+015.10%
CH09	+135.30%

DATE ITE
BY HKD

04/17/85 15:28:01

CH00	+007.53%
CH01	+027.06%
CH02	-008.12%
CH06	+017.27%
CH07	+017.18%
CH08	+015.09%
CH09	+135.39%

04/17/85 15:43:01

CH00	+007.58%
CH01	+027.10%
CH02	-008.13%
CH06	+017.27%
CH07	+017.19%
CH08	+015.08%
CH09	+135.50%

04/17/85 15:58:01

CH00	+007.63%
CH01	+027.16%
CH02	-008.15%
CH06	+017.26%
CH07	+017.23%
CH08	+015.07%
CH09	+135.59%

04/17/85 16:13:01

CH00	+007.68%
CH01	+027.20%
CH02	-008.17%
CH06	+017.26%
CH07	+017.24%
CH08	+015.07%
CH09	+135.69%

04/17/85 16:28:01

CH00	+007.73%
CH01	+027.26%
CH02	-008.18%
CH06	+017.25%
CH07	+017.22%
CH08	+015.06%
CH09	+135.77%

04/17/85 16:43:01

CH00	+007.78%
CH01	+027.30%
CH02	-008.19%
CH06	+017.24%
CH07	+017.28%
CH08	+015.05%
CH09	+135.87%

04/17/85 16:58:01

CH00	+007.82%
CH01	+027.34%
CH02	-008.21%
CH06	+017.24%
CH07	+017.32%
CH08	+015.05%
CH09	+135.96%

04/17/85 17:13:01

CH00	+007.87%
CH01	+027.39%
CH02	-008.21%
CH06	+017.24%
CH07	+017.34%
CH08	+015.04%
CH09	+136.05%

04/17/85 17:28:01

CH00	+007.91%
CH01	+027.43%
CH02	-008.23%
CH06	+017.24%
CH07	+017.38%
CH08	+015.04%
CH09	+136.12%

04/17/85 17:43:01

CH00	+007.95%
CH01	+027.46%
CH02	-008.25%
CH06	+017.24%
CH07	+017.43%
CH08	+015.03%
CH09	+136.20%

04/17/85 17:58:01

CH00	+007.99%
CH01	+027.50%
CH02	-008.27%
CH06	+017.23%
CH07	+017.44%
CH08	+015.03%
CH09	+136.27%

04/17/85 18:13:01

CH00	+008.03%
CH01	+027.54%
CH02	-008.28%
CH06	+017.22%
CH07	+017.47%
CH08	+015.03%
CH09	+136.35%

04/17/85 18:28:01

CH00	+008.06%
CH01	+027.58%
CH02	-008.29%
CH06	+017.22%
CH07	+017.50%
CH08	+015.03%
CH09	+136.43%

04/17/85 18:43:01

CH00	+008.10%
CH01	+027.62%
CH02	-008.31%
CH06	+017.21%
CH07	+017.53%
CH08	+015.03%
CH09	+136.49%

04/17/85	18:58:01
CH00	+008.13%
CH01	+027.64%
CH02	-008.32%
CH06	+017.21%
CH07	+017.54%
CH08	+015.02%
CH09	+136.56%
04/17/85	19:13:01
CH00	+008.17%
CH01	+027.68%
CH02	-008.33%
CH06	+017.21%
CH07	+017.57%
CH08	+015.02%
CH09	+136.63%
04/17/85	19:28:01
CH00	+008.20%
CH01	+027.71%
CH02	-008.34%
CH06	+017.20%
CH07	+017.62%
CH08	+015.02%
CH09	+136.70%
04/17/85	19:43:01
CH00	+008.24%
CH01	+027.74%
CH02	-008.35%
CH06	+017.20%
CH07	+017.62%
CH08	+015.01%
CH09	+136.76%
04/17/85	19:58:01
CH00	+008.27%
CH01	+027.77%
CH02	-008.35%
CH06	+017.20%
CH07	+017.67%
CH08	+015.01%
CH09	+136.82%

04/17/85	20:13:01
CH00	+008.30%
CH01	+027.80%
CH02	-008.36%
CH06	+017.19%
CH07	+017.67%
CH08	+015.01%
CH09	+136.89%
04/17/85	20:28:01
CH00	+008.33%
CH01	+027.83%
CH02	-008.36%
CH06	+017.19%
CH07	+017.68%
CH08	+015.01%
CH09	+136.94%
04/17/85	20:43:01
CH00	+008.36%
CH01	+027.86%
CH02	-008.36%
CH06	+017.19%
CH07	+017.71%
CH08	+015.01%
CH09	+137.01%
04/17/85	20:58:01
CH00	+008.39%
CH01	+027.89%
CH02	-008.37%
CH06	+017.18%
CH07	+017.74%
CH08	+015.01%
CH09	+137.06%
04/17/85	21:13:01
CH00	+008.42%
CH01	+027.91%
CH02	-008.38%
CH06	+017.18%
CH07	+017.76%
CH08	+015.01%
CH09	+137.11%

04/17/85	22:00:01
CH00	+008.50%
CH01	+028.00%
CH02	-008.39%
CH06	+017.17%
CH07	+017.88%
CH08	+015.01%
CH09	+137.28%
04/17/85	23:00:01
CH00	+008.60%
CH01	+028.10%
CH02	-008.39%
CH06	+017.17%
CH07	+017.95%
CH08	+015.00%
CH09	+137.48%
04/18/85	00:00:01
CH00	+008.69%
CH01	+028.19%
CH02	-008.40%
CH06	+017.15%
CH07	+018.06%
CH08	+014.99%
CH09	+137.65%
04/18/85	01:00:01
CH00	+008.77%
CH01	+028.27%
CH02	-008.41%
CH06	+017.14%
CH07	+018.11%
CH08	+014.98%
CH09	+137.81%
04/18/85	02:00:01
CH00	+008.84%
CH01	+028.33%
CH02	-008.42%
CH06	+017.12%
CH07	+018.16%
CH08	+014.96%
CH09	+137.95%

T A GLEASON ASSOCIATES
Environmental and Geotechnical Services

DATE
BY CHKD DATE

04/18/85 03:00:01

CH00	+008.92%
CH01	+028.41%
CH02	-008.42%
CH06	+017.11%
CH07	+018.24%
CH08	+014.95%
CH09	+138.10%

04/18/85 04:00:01

CH00	+008.99%
CH01	+028.48%
CH02	-008.41%
CH06	+017.11%
CH07	+018.34%
CH08	+014.95%
CH09	+138.23%

04/18/85 05:00:01

CH00	+009.05%
CH01	+028.54%
CH02	-008.40%
CH06	+017.09%
CH07	+018.37%
CH08	+014.95%
CH09	+138.36%

04/18/85 06:00:01

CH00	+009.12%
CH01	+028.61%
CH02	-008.38%
CH06	+017.09%
CH07	+018.51%
CH08	+014.95%
CH09	+138.50%

04/18/85 07:00:01

CH00	+009.19%
CH01	+028.68%
CH02	-008.34%
CH06	+017.10%
CH07	+018.55%
CH08	+014.95%
CH09	+138.63%

04/18/85 08:00:01

CH00	+009.25%
CH01	+028.74%
CH02	-008.33%
CH06	+017.11%
CH07	+018.59%
CH08	+014.96%
CH09	+138.76%

N 4/18/85 08:55:
8

CH00	+009.30%
CH01	+028.78%
CH02	-008.35%
CH06	+017.10%
CH07	+018.61%
CH08	+014.95%
CH09	+138.84%

04/18/85 08:55:43

CH00	+009.30%
CH01	+028.78%
CH02	-008.33%
CH06	+017.09%
CH07	+018.61%
CH08	+014.95%
CH09	+138.84%

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME - DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 2-311 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	36 min	.06'		
	126	.14		
	345	.11		
	544	.14		
	1127	.14		
	1399	.12		
	1648	.12		
	1915	.24		
	2598	.31		
	2957	.35		
	3393	.75		
	4053	.76		
	4406	.88		
	4795	1.13		
	5425	1.38		
4-17-85				Pump off 1000
				Water levels taken with Johnson water level recorder

BY _____ DATE _____ J.O. B. _____ Unit _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME-DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 3-294 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	4079 min	.16'		
	4437	.24		
	4821	.43		
	5451	.56		
4-17-85				pump off 1000

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME-DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 4-300 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				pump on 1335 @ 336 gpm
	82 min.	.01'		
	102	.02		
	147	.00		
	366	.00		
	566	.01		
	1156	.03		
	1370	.04		
	1627	.04		
	1948	.05		
	2629	.11		
	2990	.10		
	3430	.14		
	4083	.24		
	4430	.31		
	4824	.34		
	5455	.48		
4-17-85				pump off 1000

BY _____ DATE _____ CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME-DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 5-300 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	7 min	.22'		
	13	.33		
	18	.41		
	25	.46		
	30	.50		
	36	.54		
	55	.61		
	102	.78		
	322	1.35		
	531	1.72		
	1115	2.58		
	1420	2.90		
	1661	3.12		
	1901	3.25		
	2578	4.57		
	2943	5.10		
	3370	5.72		
	4038	6.72		
	4390	7.17		
	4788	7.73		
	5411	8.44		

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME-DRAW DOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 6-300 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	25 min	.01'		
	38	.07		
	60	.07		
	96	.08		
	353	.15		
	549	.18		
	1133	.30		
	1396	.37		
	1644	.43		
	1920	.51		
	2605	.75		
	2965	.85		
	3402	1.05		
	4060	1.36		
	4413	1.50		
	4802	1.79		
	5432	2.10		
4-17-85				Pump off 1000

BY _____ DATE _____ CK'D _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 PUMP TEST, TIME-DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 7-300 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	42 min	.01'		
	87	.05		
	364	.17		
	559	.30		
	1161	.59		
	1386	.71		
	1637	.83		
	1939	1.04		
	2635	1.45		
	2996	1.56		
	3435	1.87		
	4090	2.33		
	4426	2.52		
	4830	2.81		
	5460	3.21		
4-17-85				pump of 1000

BY _____ DATE _____ CHKD. BY _____ DATE _____

CLIENT Allied PROJECT No. _____ T A GLEASON ASSOCIATES

SUBJECT B-3 Pump TEST, TIME · DRAWDOWN DATA PAGE 1 OF 1

Environmental and Geotechnical Services

WELL NO.: 10-200 WATER LEVEL REF.: _____

LOCATION: _____ DATE SURVEYED: _____

OWNER: _____ WATER LEVEL REF. ELEV.: _____

DATE	ELAPSED TIME	DRAWDOWN		NOTES
4-13-85				Pump on 1335 @ 336 gpm
	4 min	2.24'		
	11	3.08		
	16	3.41		
	23	3.69		
	28	3.91		
	34	4.14		
	72	5.12		
	107	5.75		
	319	7.97		
	521	9.27		
	1111	11.47		
	1424	12.20		
	1666	12.66		
	1896	12.97		
	2573	14.08		
	2936	14.73		
	3364	15.49		
	4013	16.28		
	4385	16.92		
	4775	17.46		
	5407	18.27		
4-17-85				Pump of 1000

BY _____ DATE _____ CHKD BY _____ DATE _____